American Machinist

Volume 57 NEW YORK, DECEMBER 7, 1922 Number 23

Ordering and Storing Small Tools

Things to Do and to Avoid in Ordering Small Tools—Inspection and Storage Methods—Systems of Getting Tools to Workmen

By W. J. SANSOM

THE principal points to be considered in ordering the purchase of small tools are:

(1) The reasonable quantity that should be kept in stock, sufficient to meet ordinary demands. Careful estimating by the director will determine this and

RECORD OF TOOLS PURCHASED

Date of Reqn	Manufactured by	Cost each	Quantity

FIG. 1—CARD FOR RECORDING TOOL PURCHASES

if a record has been kept of previous purchases on perpetual inventory cards or on the form shown in Fig. 1, the matter of the quantity required for a given period will have been well established.

(2) What particular brand or make of tools has given the best satisfaction hitherto? The director should keep in touch with shop foremen on this point and keep notes for reference.

(3) Is the tool or appliance required of standard size, or is it special? If the tool is special, can changes be made on the part to be manufactured that will allow of stock sizes of tools being used? If the tool must be a special, then full details and, if necessary, a dimensioned sketch should accompany the order to the purchasing agent so that he may act with intelligence and the manufacturer may proceed without delay. Such sketches should be made with carbon duplicates as the retention of the duplicates may save a great deal of annoyance and expense.

(4) What will be the approximate cost of the tools? The superintendent is interested in costs and before he approves the requisition he should by all means know about the cost of the order.

The writer remembers a case where a tool director ordered a quantity of chasers for pipe threading machines and the order was sent to the manufacturer who discovered that it amounted to almost $1,000. This quantity being unusually large for the purchaser's needs, in the estimation of the manufacturer, an inquiry was sent to the purchaser regarding the order and, upon investigation, it was found that a $250 order would fill all requirements. If the purchaser had followed the plan of having the tool director state the approximate value of the order, the large amount of the order would have resulted in an investigation of the requirements before the requisition left the superintendent's hands.

(5) If the tools requisitioned are to replace others, can the old tools be repaired economically and returned to service? This feature of tool upkeep will require expert knowledge of costs and ability to discriminate between tools that are beyond repair and those that may be salvaged.

(6) If the required tools are to be used only occasionally, can the tool be borrowed from some other department within the works?

The card shown in Fig. 1 is useful for keeping track of tools purchased and the form to be used by the tool director in requisitioning through the purchasing department is shown in Fig. 2. So that there shall be no duplication of orders, no one should be authorized to requisition tools except the tool director. Foremen of departments should be required to send all requests for tools to the tool director as he would perhaps be able to furnish the required tools from stock or would at any time be able to offer suggestions that would avoid the necessity of ordering them.

Upon receipt, purchased tools should be subjected

CHECK DEPARTMENT REQUISITION. Date_____ 191_

Material on this order should be delivered by_____ 191_

Quantity	Name of Article	Description	Sold by	Value	
			Total		

Approved_____ Superintendent

_____ Tool Director.

FIG. 2—TOOL REQUISITION FORM

to a careful examination for defects in material, and, if necessary, be measured for accuracy of sizes. If hardened tools have been ordered to a stated degree of hardness they should be given a hardness test. The manufacturers of products requiring a high degree of interchangeability of parts often specify that taps be furnished with limits on variations from the stated pitch diameter. Milling cutters must be checked in many cases for sizes and shape.

The matter of tool inspection is one which must be left to the intelligence of the director of the department and can very easily be carried to extremes, but it is time profitably spent and the writer has found from experience that the manufacturers of small tools are more than willing to rectify an error and are pleased to have the trouble brought to their attention. This brings to mind a case where a manufacturer furnished a large hob costing about $140 for cutting gear teeth. Upon inspection this hob was found to be cracked almost its entire length due to improper heat treatment.

TOOLS IN STOCK

DESCRIPTION.

DATE	IN	OUT	BALANCE

FIG. 3—PERPETUAL INVENTORY CARD

The manufacturers were notified of the defect and agreed to replace the hob should it break down. It proved necessary for them to fulfill their promise very shortly afterwards. This instance shows the importance of inspection, for had the tool been used before the defect was noticed it would not have been so easy to make a complaint. The director should be very sure that his complaint is justified before taking any action. Failure to prove his statement upon investigation by the manufacturer would result in nullifying any future complaint that he might make and would mark him as unreliable.

After the inspection of new small tools, they should be locked up either in a special room provided for that purpose or in cupboards. None but the director and one other responsible check room employee should have access to these stores. A card record, conveniently located, should be kept of all material stored and as the stock is replenished or removed, an accounting should be made directly on the record thus keeping a perpetual inventory, see Fig. 3. Only such tools as are necessary for the shop should be in circulation and no tools should be withdrawn from the stock room until the old tools they are intended to replace are beyond repair.

Micrometers may be kept in a case having a glass door and should be so arranged as to hang in plain sight. A red background of the same outline as the micrometer will indicate any tool that is in service, the tool covering the outline when hanging in the case. Hooks should also be provided in the case for checks and the case locked up after working hours. It is sometimes preferable to have special boxes made for micrometers, each box containing an adjusting wrench and standard reference disk, the whole outfit being checked to the workman as a unit.

In some shops it is customary to obtain a written order from the shop foreman to get micrometers from the check room but this should really be unnecessary except that perhaps it will prevent workmen using such tools on work that can be done with ordinary calipers and so release the micrometer for other more important work. Verniers and other fine measuring tools, such as gage blocks that are used only for standard reference, may also be stored in the same way and the director should see that they are returned to their respective places at the close of the working day.

A rack containing a large number of bins, preferably of steel, should be erected for storing drills, reamers, mandrels, and kindred tools. A separate bin should be provided for each size of tool. Racks should be designed that will allow increase of the size of any bin to suit the quantity of tools to be stored and so economize on space. If the racks are of wood, the expansion feature may be provided for by having ⅛-in. saw cuts at half-inch intervals directly opposite on the top and bottom of the shelf and using number twelve gage sheet iron for the sides of the bin.

Machine screw taps and number drills may best be taken care of by using a cabinet containing shallow drawers with partitions for each size of tool. Another good plan is to use small hardwood blocks drilled to receive the tap, tap drill and body size drill and check the outfit to the workman as a unit. The blocks can be incased in a collar made of standard iron pipe slightly tapered in the bore to permit of the block being driven in and so avoid splitting of the wood. The smaller sizes of pipe taps can be handled in the same way but the larger sizes will necessarily have to be handled separately on account of their bulk. Tap wrenches will occupy the least space if a small hole is drilled close to the end of the handle so that they may hang on nails driven into a board.

Toolholders should be separated as to size and kind in individual bins. Forged tools should be kept in an open cabinet with shallow shelves and separated according to shape, size and whether carbon or high-speed

RECORD OF JIG N° J 834

LOCATION, SECTION D BIN 22

WRENCH.	BUSHING.	BOLT.	STRAP
3/4" end	31/64"	2-3/4"	2 × 5/8 × 10
	1/2"		

TOTAL NUMBER OF LOOSE PARTS 6

FIG. 4—JIG RECORD CARD

steel. A symbol letter should be stamped on the tool indicating the brand of steel of which it is made and figures should be used to indicate its shape. A copy of these symbols should be furnished for the use of the tool dresser so that he will give the proper heat treatment. Die stocks may be economically disposed of in the same manner as tap wrenches. For the sizes in common use around the shop it is better to furnish full stocked dies, leaving the dies set permanently. This will save the workman's time in setting the die

and offset the small additional expense of the die stock.

Pipe and U. S. standard hand dies can be stored in shallow drawers partitioned off and labeled for each die, the same segments of the die always being kept together. Chasers for bolt and pipe threaders should be stored in separate shallow bins and kept in sets as received from the manufacturer and this is especially important where it is the custom to use chasers that have been recut. While these chasers are generally supposed to be interchangeable it will be found that it is preferable to keep the sets intact as only by so doing can the best results be obtained and spoiled work be reduced to a minimum.

Spring dies and hollow mills, when not kept on their permanent arbors, may be stored in trays in which wooden pegs, smaller in diameter than the holes in the cutters, are fastened vertically to the bottom board by means of screws. The cutters may then be arranged in groups according to type and size. Milling cutters can be kept in an orderly manner by hinging wooden leaves around a post or a stand built for that purpose, hanging the cutters on nails and labeling each space according to the cutter to be placed thereon. Extra large and heavy cutters will of necessity have to be kept on shelves properly partitioned for them.

Gear cutters may be stored in the same way as milling cutters and a convenient plan of the board is to arrange by pitch vertically and by the number of the cutter horizontally. A good supply of standard sizes of bolts of various lengths should always be on hand and kept in such condition that the nuts may be run down the full length of the thread with the fingers. A bolt on which it is necessary to turn the nut with a wrench is an abomination. Straps of different sizes and kinds with bolt holes drilled every two inches of length should also be on hand in liberal quantities.

Storage of Blueprints

Provision is made in many factory systems for furnishing a drawing of the part to be made with the shop order but as a general rule it is necessary for the workman to get his blueprints from the check room. In order to protect them they should be mounted on stiff cardboard or on sheet iron and then be shellacked to allow for the removal of grease. Blueprints so mounted may be stored by filing vertically in deep drawers in the same way as office records are filed. The prints may be separated by index sheets also of iron with the blueprint number thereon and provided with a receptacle or clip for receiving the workman's check.

An accurate record of all prints in the shop should be kept by the tool director so that if a change on the print is necessary, it will be possible to know exactly how many prints at a given time are in service and to see that all are returned to the drafting room when changes are made, thus avoiding the possibility of an old print being used in the shop and a quantity of work spoiled through the change not being noted thereon.

Welding torches and all appliances, wrenches, etc., should be stored in a box provided with lock and key and charged to the workman as a unit, a card record of the contents which should comprise a standard equipment being kept in the check room. Tool cabinets may be designed of square or hexagon shape mounted on a ball bearing base to permit of being revolved. Such an arrangement is very convenient and economical in the amount of floor space occupied.

Jigs and fixtures are usually of such a bulky nature as to cause considerable trouble in providing for their proper storage and accessibility. If a large number of such tools are in frequent use it is well to have a separate room devoted exclusively to their storage. Substantial bins should be erected, each section being small enough, about six feet in length, to allow for removal without interference with the arrangement in general should the occasion arise and each section should be partitioned to suit each individual jig in so far as is practical. A card record should be kept of all jigs in storage indicating the section and the number of the bin and the quantity and size of straps, nuts, bolts and loose parts such as removable bushings, special wrenches, etc. See Fig. 4.

Systems for Checking the Tools

Sections may be distinguished by letters and the bins by numbers. For instance, the tool attendant knowing the number of a jig, would find on his card record that it is stored in section D, Bin 22, and would note the quantity of loose parts that must be used with the jig. Each section of bins may be easily lettered by nailing a piece of sheet iron to the top and painting the letters thereon very prominently. The bins may also be numbered either directly on the shelves or by a square piece of sheet iron on which the number is painted. If the bins are painted black and the numbers in chrome yellow a good contrast is obtained, making the figures easily discernible at a distance.

A large machine-tool factory in the middle west employed a number of messenger boys whose duties consisted of taking workmen's checks and getting tools for them from the check room. These messengers were stationed at certain points in the shop and were at the beck and call of the workmen. The system was not an unqualified success principally because the boys revolted from such menial duties in a very short time. As no boy with ambition would accept such a position, it took considerable energy to keep up a force of trained messengers and after a fair trial the plan was dropped.

Another concern manufacturing farm tractors has a shop telephone system operating directly between groups of machines and the check room. The telephones are numerous and conveniently placed. The floor inspector upon observing that a machine is nearing the end of a job will notify the time-keeper and routing clerk to that effect. The routing clerk then notifies the check room of the job next in order for that machine. The check room, having a card record of all tools used on the job, will deliver the tools required to the machine and at the same time bring back the tools not needed from the previous job.

If the tools require sharpening, the workman telephones the check department to that effect and either another tool is sent out or the dull tool is called for, sharpened and returned. This method is a good one and the messenger boy is not necessarily kept on the same job every day as it can be arranged to alternate the duties so that a boy may spend one day delivering tools and the next day be kept busy on work within the check room such as sorting, sharpening and repairing tools.

If it is thought preferable to give written rather than verbal orders to the check department the routing clerk could easily send this order by means of a pneumatic tube if compressed air is available in the shop. Where there are several check rooms in one factory, a telephone system is a great convenience to the tool

director enabling him to reach distant points easily and to keep on the trail of his men far better than if it were necessary for him to walk around the plant.

A common fault with most check room windows is the lack of space provided for the workmen to receive their tools, usually only one or two men being accommodated at the same time. To avoid this condition, the windows should be at least six feet in length and of a generous height with ample shelf space.

A Plan for Unit Storing

A highly commendable plan, where sufficient tools are in stock to permit of such an arrangement, is to assemble all tools used on a particular piece of work in a box, not allowing them to be used on any other work than the piece specified. The box would be given a number or symbol and be identified by it. A printed card should be fastened on the box preferably in a label holder to permit of the card being changed and stating exactly the tools that should be therein. Upon the tools being returned to the check room, they should be ground and put in first-class condition ready for the next order of these particular pieces. This method wherever possible, will prove to be very efficient, and a big time saver, inasmuch as the tools are always ready and exactly suitable for the next job.

Engineering Sales Methods

By C. J. Morrison

Engineering sales methods instead of ordinary salesmanship will save the day for the machine-tool builders if applied in an energetic, constructive manner. The field at present for installations in new or enlarged shops is not large, but the field for replacing old, worn out and obsolete machines is very large and is the one in which engineering methods are particularly needed and where these methods will bring in results satisfactory to both the customer and the builder.

It is not sufficient simply to tell a machine-tool user that he should replace his old machines with new ones, but he must be shown in a concrete way what profit will be made on the investment. A study should be made of the manufacturing methods, the present costs of operations determined, and a report submitted showing the economies to be effected by purchasing new equipment and the returns which this will give on the investment. It is too much to expect the average shop manager to do this for himself and, besides, he may not know the times that are required for operations on the new machines, or he may not realize the hand work that may be eliminated by the use of machines which will produce more accurate work than the ones he is using.

The Policy of One User of Machine Tools

There is one very large user of machine tools who has a fixed policy that any machine replacing an old one must pay for itself in five years. This company has very accurate costs, is always willing to be shown, and places all the necessary information at the disposal of any reputable concern which wishes to submit a proposition. However, it is a pure waste of time simply to state that the proposed machine will meet the requirements and pay for itself in five years. A detailed report with blueprints showing the set-ups and times must be submitted, but if this report proves the case, a sale is almost certain.

Probably the biggest field for replacements is in the railroad shops, most of which are loaded up with machines that outlived their usefulness many years ago. Also the railroad shops have a large number of home-made machines, many of which are quite efficient, but others of which are expensive jokes. These conditions are due largely to the fact that the shops are side issues with the railroads and are simply tolerated as an unavoidable expense. Appropriations for machines are hard to get and are often so curtailed that a compromise has to be made and machines purchased that are not all they should be, but which are cheap. This condition also accounts for many of the home-made machines because they can be manufactured without a special appropriation.

An educational campaign conducted by engineer salesmen will develop this field. These men should work with the superintendents of motive power and prepare reports for the officials who control the appropriations showing exactly what economies the proposed machines will effect and particularly the reductions that will be made in the time lost by locomotives and cars undergoing repairs. These men thoroughly understand charts and figures and if the facts are properly presented to them, sales can be made. Once the purchase of specific machines is authorized, the purchasing agent will buy them and nothing else.

There has been too much effort made to sell the railroads merely lathes, planers, boring mills, and machines of a similar class, and too little to show specifically what certain machines would accomplish. The railroad officials have been prone to authorize the purchase of a certain number of each kind of machine and the purchasing agents naturally bought the cheapest they could get. Under those conditions the men in charge of the shops have become discouraged and have taken what they could get and not what they wanted. The machine-tool builders can change these conditions and, as a result, sell many machines.

Railroad Shops Have Little Use for "Repetitive" Machines

A mistake that has frequently been made in the past should be carefully guarded against, that is, of trying to sell the railroads machines that are particularly efficient only for repetitive manufacturing. The railroads have little use for such machines and, outside of a few in the main shops of the larger roads, they are more of a hindrance than a help.

The textile plants and the companies manufacturing textile machinery afford another good field for engineering salesmanship, but these concerns will have to be shown in very much the same way that the railroads must be shown. In this field considerable engineering ability may have to be used because the textile industry is filled with the traditions of how grandfather did things and probably it has taken less advantage of modern metals and practices than has any other industry. In order to make sales, the engineer may have to go so far as to redesign some of the textile machines, but the field is so full of opportunity that the effort can scarcely fail to obtain the desired reward.

Other fields can be developed in the same way, but the two mentioned are the most promising at the present time. Of course the work involved in carrying out the suggestions made is a species of "free service" but the results will certainly be far more profitable than allowing shops to run on part time and of offering to sell machines at cost for the one and only purpose of keeping the plant running.

Maintenance of Small Portable Power Tools

First of Several Articles — Periodical Inspection of Prime Importance —Schemes to Insure Thorough and Regular Lubrication

By R. P. WALSH

TOOLS WHICH are used for fabricating or measuring to exact dimensions and commonly known as "Precision Tools," have been so well covered in trade periodicals that their construction and uses are generally known. There is, however, a large class of important tools common to steel fabrication trades that has not received the attention it deserves.

Pneumatic drilling machines, riveting and chipping hammers, holder-on machines, rivet sets, countersinks, twist drills and bridge reamers are examples of tools included in this class. It is proposed in what follows to deal with some representative tools of the "Non-precision" class so that users of such tools may, it is hoped, be given information which will result in their more economical use. The necessity of keeping accurate

TYPE — PURCHASED
CAPACITY — COST
M'FGR. — M'FGR. NO.
PLACED IN SERVICE — SHOP NO.

RETURNED FOR REPAIRS	REPAIRS COMPLETED	NATURE OF REPAIRS	PARTS REPLACED	COST OF MATERIAL	COST OF LABOR	COST TOTAL

FIG. 1—GENERAL INFORMATION RECORD CARD

and detailed records of tools, so that such records may be consulted when considering the purchase of new equipment, is generally recognized, but in a large percentage of cases ignored. The pneumatic drilling machine is a case in point. This is a portable power tool of complicated mechanical construction which is in a class by itself in the amount of abuse it is called upon to withstand in service.

Operated by compressed air, its pistons and valves are subjected to the abrasive action of water of condensation containing particles of iron oxide or other matter from the walls of the compressed air piping. This is particularly true where the machine is used outdoors in cold weather.

The speed of a pneumatic drilling machine is never constant, fluctuating according to the hardness of the material being drilled and to the irregularity of feed, the latter depending upon the skill of the operator. In addition, and with few exceptions, the machine is moved for every hole. When the operator is working on a piece work basis, hundreds of holes are drilled or reamed during the day, necessitating rapid shifting of the machine, and increasing the liability of damage. Great care must also be exercised by the operator in manipulating the machine when the drill is breaking through the work.

A proper record on this type of machine, see Fig. 1, should contain the following information: Type, capacity, name of manufacturer, date of purchase, cost, manufacturer's serial number, shop identification number, date when placed in service, a complete record of all dates when the machine was returned to shop for repairs, when machine was again placed in service together with details as to the nature of the repairs, parts replaced, their cost and the labor involved. If, in addition to the foregoing, the rule be followed of turning in all machines at the end of the working period for lubrication, a close approximation can be made of the actual number of hours a machine has been in operation and thus its suitability may be determined.

It is of prime importance to have all portable power tools turned in at regular periods for examination as it frequently happens that such an examination discloses defects which might do serious damage to a tool if not discovered in time. Because of the extent to which pneumatic drilling machines are employed, their high cost and their liability to damage due to the severe conditions under which they are used, it is considered desirable to describe how such tools are handled in a large ship yard with satisfactory results.

The purchase of the machine is based solely on merit as determined by its performance under tests governed by actual service conditions. Weight is also given to all pertinent data such as previous experience with the type being tested, economy of operation, cost of spare

MACHINE — YARD NO.

MUSTER NUMBER	TOOL CHECK NO	ISSUED	RETURNED	JOB

FIG. 2—TOOL ISSUE RECORD CARD

parts, ease of repair, ease of operation, etc. The price of the machine is, of course, important but is not considered more so than performance.

After the purchase of the tool, it is drawn from stock on a standard form of requisition and delivered to the main toolroom where it is card indexed, given a shop identification number, lubricated, operated for a few moments without load and then assigned to a place on the issuing rack. A second index card, Fig. 2, is used when the machine is issued to record the name of the mechanic requiring it, as well as the date of

issuance and job he is on. The date of return to the toolroom is also noted. This procedure is repeated each time the machine is issued.

Upon each return of the tool to the toolroom it is tested to determine its condition and, if found in proper working order, it is then lubricated and placed upon the issuing rack. Machines found defective are tagged and set aside for repair. Lack of periodic and proper lubrication is without doubt responsible in a greater degree than any other factor for shortening the life of a pneumatic tool. In the ship yard referred to, it is required that each drilling machine be turned in to a greasing rack upon the completion of the work period for oiling and greasing. This rack is of convenient form and boxed in so that it can be locked; moreover it is so located as to make it convenient for the men to turn in or obtain their machines. Wherever it is necessary two or more of these racks are used.

When the operator reports for work at the morning muster, the supervisor at the muster check board hands him a linen tag with stub attached. Both tag and stub are numbered and bear the date issued. Before turning in his machine upon completion of the day's work, it is required that the mechanic tie the large section of the tag to the feed screw spindle, retaining the stub. Upon presentation of the stub the following day at the morning or noon muster, the machine is returned except when the stub is presented two days later than the date indicated by stamp on the stub.

Checking up on Lubrication

In order to enable the "greaser" to spot at once any machine that has previously been oiled and greased and to avoid duplication of work, and also pick out machines that have remained on the rack for three successive days, the machine tags as shown in Fig. 3 are used in three colors, red, white and blue. A red tag is issued one day, a white tag the next day and the blue tag on the third day. The "greaser" working on a blue tag day knows that any machine having a red or white tag attached has already been oiled and greased and also knows that any machine with a blue tag of a date other than that on which he is greasing has been on the rack at least three days. After a machine has remained on the rack for three days it is returned to the toolroom in order that the number of idle machines may be reduced to the minimum.

No driller is permitted to have more than two machines (they must be of different capacities) on tool checks at any one time. If some of the machines prove more satisfactory than others it is frequently the practice among the operators to hide away the live or dead handle of a machine preferred to the others thus to insure that no one else can use it. As this practice, if unchecked, means the loss of small parts and the existence of a class of "pet" machines, penalties should be inflicted in such cases where the parts were found missing and steps be taken to bring all machines to the same high rating. The machines appearing on the list of those oiled and greased during the night should be checked against the list of machines shown to be in service and operators having tool checks on machines not appearing on the list of machines greased are called upon for an explanation, which, if unsatisfactory, results in disciplinary action being taken. Usually the delinquent is warned on the first offense and on the second reduced in rating.

While the system of using the three colored linen tags has proved quite satisfactory for the yard in question it is considered that the duplicate brass check system is more generally satisfactory. In the latter system, the operator, when turning in his machine at the end of the work period, receives a numbered brass check from the man in charge of the greasing rack and the duplicate, suspended from a split brass ring, is forced on to a spoke of the feed screw handle. By this arrangement no time is lost in turning in the machine, and it is not necessary for each individual mechanic to carry a linen tag in an overalls pocket during the day and tie such a tag on the machine when turning it in to the greasing rack. Often the linen tag when handled by greasy hands becomes soiled, making it impossible to decipher the tag number and

FIG. 3—COLORED TAG USED TO AVOID DUPLICATION OF GREASING. FIG. 4—REPAIR TAG

causing confusion in identifying the machine it covers. Such tags are also easily destroyed and it is necessary to carry a considerable supply in stock, whereas the brass checks may be used over and over again indefinitely. Under the duplicate brass check system, all machines, not claimed at the morning muster, are returned to the main toolroom and no machines are held on the racks. This means that a smaller number of machines may be carried in stock.

Inspection and Maintenance Suggestions

As previously stated, the periodic lubrication of pneumatic drilling machines is of the first importance, if they are to be kept in good working order. At the present time, there are on the market oils and greases specifically made for pneumatic tools and these may be purchased from the manufacturers of the tools. It is not well to experiment with unknown lubricants.

As a means of prolonging the life of his machine, a driller should up-end the tool for a short interval, for example, during the time it is laid down to change a reamer or twist drill, or for any other reason. This permits the oils and greases to run back over the crankshaft, pistons, etc. When the machine is in use the lubricants tend to gravitate away from the upper work-

ing parts. In the smaller, faster running machines this precaution cannot be ignored and if followed will do much to cut down the cost of repairs.

At the periodic examination a careful scrutiny should be made of the condition of the internal wall and the slot of the spindle taking the Morse taper shank of the tools driven by the machine. For this purpose a small electric light bulb, such as is used on a pocket flashlight may be employed in combination with a dry cell. The light bulb connected to wire leads from the battery, of sufficient length to fully explore the length of the spindle, is lowered through the spindle hole and illuminates the interior surfaces so that their condition may be observed.

All abrasions of this interior surface should be removed either by reaming or scraping and all spindles whose slots are found to be worn too large should be replaced. If this practice is followed the number of drills, reamers, countersinks and other tools rendered unserviceable because of broken or twisted tangs will be very materially reduced. A single pneumatic drilling machine with a defective spindle can ruin more tools, without being suspected, than any other destructive agent known.

Morse taper shanks are ground to size so that they may intimately fit the sleeve, socket or spindle used as a medium in the drive and consequently any inequality of the internal surface of the sleeve, socket or spindle which does not permit the intimate contact serves to throw the torque of the drive on the tang of the Morse taper shanked tool, with the inevitable result of injuring the tang. Greasy or dirty tool shanks are also a prolific source of tang destruction. When a tool is turned in for repairs, the linen tag shown in Fig. 4 is attached to it and remains with it until the tool is repaired, tested and returned to the tool room, ready for re-issue.

Misapplied Machine Tools—Discussion

BY S. R. HOLMES

The writer wishes to add his "Amen" to the article with the above caption on page 736, but thinks the most glaring and expensive example was overlooked by Mr. Nevin.

Can a man who respects fine machine tools see a precision lathe used with a grinding attachment, without gnashing his teeth? Such jobs usually require accuracy and therefore the best tool-room lathe available is selected. How long can the shears, cross-slide and leadscrew be expected to retain their accuracy when a little abrasive dust is occasionally added to the necessary lubricating oil?

If a lathe is not built to stand milling operations, how much less will it stand the after effects of grinding? The writer has seen examples of the finest lathes practically ruined, so far as accurate tool-room work is concerned, in two years' time, by workmen who were otherwise careful but used their lathes occasionally for grinding. Similar lathes, after twenty years of service, were practically as good as new. The grinding must be done dry, and it is impossible to protect the working parts referred to. Bench lathes are of course used for grinding operations, but the compound rest and threading attachment are first removed and the plain surface of the bed is easily cleaned.

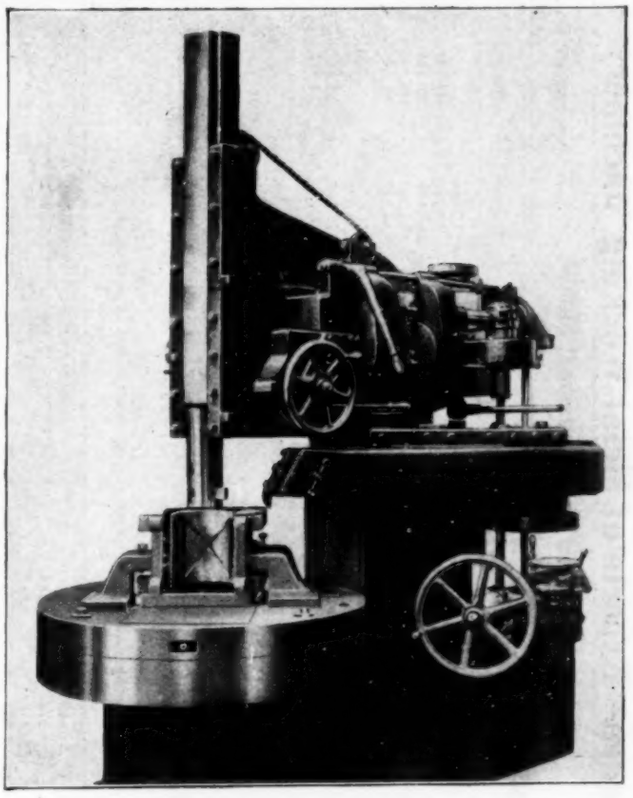
Modern grinding machines form a part of the equipment of any shop likely to have a precision lathe, but they are usually not equipped for grinding threads, and a lathe with some portable grinding attachment is "misapplied" to the job. The threads so produced, even if good, are expensive when the injury to the lathe is considered.

A Correction

Through an unfortunate mistake the article "Repair Work in a Tennessee Railroad Shop," which appeared in our last issue, was published before it had been approved and released by the Southern Railway System.

In releasing the article for publication, the Southern Railway System requested the following changes as here set forth:

The first illustration showing the repair on a slipper type crosshead, should have been omitted together with the description of how the repair was made. Repairing fractures by the method given is contrary to the approved practice of the Southern Railway System and is resorted to only in extreme emergencies that are, of course, of infrequent occurrence.



BORING AND FACING MILL FOR LOCOMOTIVE DRIVING BOXES

In explanation of Figs. 2 and 3 showing repairs on an air-pump head and a piston it was stated that brass is used. The material used to build up the worn surfaces is Tobin bronze which is an alloy giving much longer wearing life than brass.

Since the article was written, the practice of boring driving boxes has been changed so that the method shown in Fig. 4 is now obsolete. The vertical boring and facing mill, shown in the accompanying illustration, built by William Sellers & Co., Inc., especially for boring and facing driving boxes, has been installed and the work is now done in a much more efficient manner than was formerly the case.

Sweden—Exports of Metal Working Machinery

TABLE VII

"Maskiner for Bearbetning af Metaller"

Country	1909		1910		1911		1912		1913		
	Kg.	Kroner	Kg.	Kroner	Kg.	Kroner	Kg.	Kroner	Kg.	Kroner	Kg.
Norway	33,310	23,764	39,063	35,543	81,495	75,545	.....	.....	.....	.....	18,069
Finland	55,387	47,144	31,869	25,153	90,896	93,276	57,749	52,765	.....	.....	95,668
Russia in Europe	110,617	302,057	73,780	150,046	95,997	187,137	191,321	231,361	92,215	137,395	368,499
Denmark	43,439	29,520	66,601	45,469	118,625	72,527	149,342	96,456	191,290	140,706	127,240
Germany	32,683	43,378	39,835	90,237	114,144	144,070	16,644	37,394	20,460	21,900	84,372
Netherlands	421	2,135	2,473	5,380	.....	.....	.....	.....	.....	.....	.....
Belgium	3,870	5,290	13,854	13,467	18,894	30,395	.....	.....	.....	.....	.....
Britain	12,464	13,709	19,416	20,296	21,653	23,158	13,573	14,330	19,848	26,280	17,037
France	2,679	4,745	9,841	18,135	53,828	58,559	32,812	35,430	59,518	69,587	8,300
Spain	1,396	2,073	1,250	1,250	.....	.....	.....	.....	.....	.....	.....
Portugal	735	700	1,635	2,060	.....	.....	.....	.....	.....	.....	.....
Italy	287	1,080	249	1,400	.....	.....	.....	.....	.....	.....	.....
Switzerland	.....	.....	5,894	8,750	.....	.....	.....	.....	.....	.....	.....
Austria	864	970	2,610	7,603	13,124	19,960	.....	.....	.....	.....	.....
Hungary	501	1,292	826	690	.....	.....	.....	.....	.....	.....	.....
Roumania	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bulgaria	22	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iceland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egypt	.....	.....	71	44	.....	.....	.....	.....	.....	.....	.....
British South Africa	933	1,750	636	520	.....	.....	.....	.....	.....	.....	.....
China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Japan	545	295	3,272	2,306	.....	.....	.....	.....	.....	.....	.....
Other Asia	240	150	.....	.....	.....	.....	.....	.....	.....	.....	.....
Australia	3,510	3,213	13,584	13,856	17,436	17,771	.....	.....	10,710	11,150	11,228
British North America	920	850	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States of America	993	2,000	712	4,100	.....	.....	.....	.....	.....	.....	.....
Brasil	1,380	555	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	3,260	2,292	2,041	1,970	.....	.....	.....	.....	.....	.....	.....
Other Countries	.....	.....	.....	.....	22,221	31,087	227,088	294,104	202,598	262,836	185,453
Total	310,456	489,002	329,512	448,275	648,313	753,485	688,529	771,840	598,339	669,854	915,866

Par value of Krona — 26.80c.

Note.—Only monthly reports are available for 1920 and 1921—the figures do not show the countries of destination, and metal working machinery is included with woodworking and other industrial machinery.

Sweden—Imports of Metal Working Machinery

TABLE VIII

"Maskiner for Bearbetning af Metaller"

Country	1909		1910		1911		1912		1913		1914	
	Kilograms	Kroner	Kilograms	Kroner	Kilograms	Kroner	Kilograms	Kroner	Kilograms	Kroner	Kilograms	Kroner
Norway	40,488	20,573	44,756	46,514	62,059	66,589	.....	.....	.....	.....	.....	.....
Finland	3,210	2,552	1,953	1,232	.....	.....	.....	.....	.....	.....	.....	.....
Russia	3	43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denmark	9,325	15,087	59,614	72,750	51,620	49,806	.....	.....	38,052	33,684	20,323	29,219
Germany	1,065,990	827,195	1,445,973	1,060,176	1,532,656	1,207,591	1,015,038	1,200,456	1,590,190	1,741,685	985,919	1,124,310
Netherlands	8,693	5,560	16,139	4,890	.....	.....	.....	.....	9,821	11,534	.....	.....
Great Britain	235,109	249,108	324,344	345,335	336,557	341,213	178,163	210,199	213,848	334,356	214,261	304,442
France	9,513	9,549	2,701	3,387	.....	.....	.....	.....	.....	.....	.....	.....
Switzerland	1,767	1,874	113	694	5,787	16,688	.....	.....	.....	.....	.....	.....
Austria	110	679	51	556	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	.....	.....	2,001	5,727	48,482	12,114	.....	.....	.....	.....	.....	.....
United States of America	152,054	241,698	249,165	356,055	223,095	389,119	257,998	448,934	612,211	1,054,671	310,738	571,745
Other Countries	.....	.....	.....	.....	21,435	11,354	148,920	208,491	99,867	142,514	95,519	128,763
Total	1,526,262	1,373,918	2,146,810	1,897,316	2,281,691	2,094,474	1,610,119	2,068,080	2,563,989	3,318,444	1,626,760	2,158,479

Sweden—Exports of Metal Working Machinery—*Continued*

TABLE VII

"Maskiner for Bearbetning af Metaller"

Country	1914 Kroner	1915 Kg.	1915 Kroner	1916 Kg.	1916 Kroner	1917 Kg.	1917 Kroner	1918 Kg.	1918 Kroner	1919 Kg.	1919 Kroner
Norway	10,071	58,915	65,619	505,524	747,978	425,480	1,066,200	610,698	1,926,194	392,486	1,087,723
Finland	169,693	508,214	936,566	513,421	1,115,237	220,325	707,815	31,742	91,024	52,770	240,598
Russia in Europe	739,626	1,992,561	4,539,405	2,259,053	5,914,629	1,323,747	4,193,567	12,477	40,949	.....	.....
Denmark	89,889	386,581	516,898	375,990	533,566	142,638	226,860	267,174	763,871	238,445	435,262
Germany	75,150	433,023	870,148	382,757	1,385,768	1,589,615	6,010,000	5,117	32,525	.....	.....
Netherlands	.....	.....	.....	125,170	311,285	111, 08	319,869	505,456	1,739,126	78,922	297,989
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	.....	32,709	145,036
Britain	18,747	45,489	58,004	19,299	47,314	47,867	182,398	139,112	897,044	86,380	248,937
France	17,760	8,790	10,340	99,976	274,029	56,837	150,916	.....	.....	144,860	455,202
Spain	.....	.....	.....	.....	.....	.....	.....	.....	.....	28,476	97,288
Portugal	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	.....	.....	.....	6,100	13,000	.....	.....	.....	.....	30,491	154,940
Switzerland	.....	.....	.....	.....	.....	.....	.....	8,900	25,950	.....	.....
Austria	.....	228,922	508,505	86,083	248,830	219,763	760,050	19,084	69,635	.....	.....
Hungary	.....	35,798	93,150	.....	.....	.....	.....	.....	.....	.....	.....
Roumania	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bulgaria	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iceland	.....	.....	.....	1,947	2,064	.....	.....	.....	.....	.....	.....
Egypt	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British South Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Japan	.....	.....	.....	.....	.....	5,416	29,500	.....	.....	.....	.....
Other Asia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Australia	11,095	.....	.....	5,739	10,305	.....	.....	.....	.....	.....	.....
British North America	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States of America	.....	.....	.....	27,925	104,493	.....	.....	42,915	233,657	.....	.....
Brazil	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Countries	219,702	210,828	261,009	136,699	231,303	259,982	553,497	146,605	472,309	292,373	890,833
Total	1,351,733	3,909,121	7,859,644	4,545,683	10,939,801	4,402,678	14,200,272	1,789,280	6,292,284	1,377,912	4,053,808

Par value of Krona 26.80

Note.—Only monthly reports are available for 1920 and 1921—the figures do not show the countries of destination, and metal working machinery is included with woodworking and other industrial machinery.

Sweden—Imports of Metal Working Machinery—*Continued*

TABLE VIII

"Maskiner for Bearbetning af Metaller"

Country	1915 Kilograms	1915 Kroner	1916 Kilograms	1916 Kroner	1917 Kilograms	1917 Kroner	1918 Kilograms	1918 Kroner	1919 Kilograms	1919 Kroner
Norway	7,277	15,877	34,445	143,646	104,873	370,412	45,613	214,148	35,623	78,504
Finland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Russia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denmark	4,935	9,631	124,690	284,806	208,811	593,783	229,562	729,394	63,055	204,082
Germany	165,624	198,396	454,131	496,741	200,763	162,992	207,636	273,245	931,699	1,260,328
Netherlands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Britain	78,071	100,409	6,925	15,027	.....	.....	2,108	4,397	12,008	17,503
France	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Switzerland	.....	.....	5,081	13,896	.....	.....	594	762	.....	.....
Austria	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States of America	391,365	725,112	523,298	1,078,372	274,028	802,586	236,307	929,079	920,046	3,121,620
Other Countries	100,868	138,853	72,983	106,130	107,936	255,794	71,027	207,099	116,568	286,210
Total	748,131	1,188,278	1,221,553	2,138,618	896,411	2,185,567	792,847	2,303,224	2,078,999	4,968,247

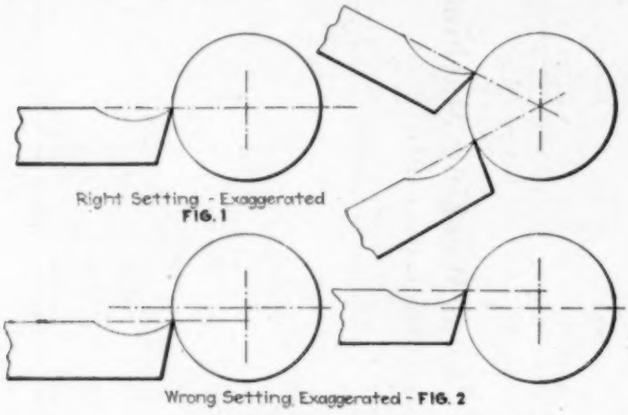
Par value of Krona is 26.80c.

Know Why You Do Things

By S. R. Hunter

Some of the articles published in *American Machinist* under the above title, during the early part of last year have brought out, in a very entertaining and instructive manner, some points which were under discussion when I first entered the shop as an apprentice. Doubtless the same subjects were argued over long before that time, but, as a charter member of the "Irememberwaybackwhen" Club, I would like to recall attention to those articles which contained discussions as to whether or not a lathe tool (I refer to the point of the tool) should be set above, upon, or below the center line of the work being turned.

It is evident that a great difference of opinion will be expressed, because of the application of the question to different jobs and conditions of work. I believe every practical lathe operator and machinist will admit that it is much easier to face a disk true and without chatter marks if the tool point is set slightly lower than the center of the disk to be faced, but on cylindrical work there will, doubtless, be room for argument.



FIGS. 1 AND 2—RIGHT AND WRONG SETTINGS OF LATHE TOOLS

Generally speaking, I am of the opinion that the best results can be obtained if the cutting edge of the tool is set on a radial line from the center of the work being turned (See Fig. 1) and I believe John Brent had this in mind in his article which appeared on page 565 in the March 31, 1921 issue of the *American Machinist*.

This setting may be obtained usually by tipping the tool either up or down at the point as the case may be. With the possible exception of a job of large diameter, I do not believe any benefit will be derived from having the point of the tool set below or above the center line (See Fig. 2) and not set at any angle corresponding to a radial line drawn from the center of the work. The radial line with this setting should be parallel to the top of the cutting tool.

I take exception to Mr. Brent's statement that "the machine for grinding tools is of no use to a real machinist," as I believe every machinist, real or otherwise, who has been privileged to use turning tools ground on a machine would never have any desire to go back to the old method. The saving in time, which results in having all turning tools ground on a machine, is a very big factor from the viewpoint of reduced cost of production, to say nothing of the inconvenience to which the machinist is put when he is obliged to shut down his machine, make a trip to the grinder, and perhaps stand in line, waiting his turn, in order to grind his own turning tools to meet his individual fancy.

Anyone who has worked in a shop where it is only necessary to turn in the dull tool at the crib or go to the board where wooden models of all standard tools are kept and to pick out the number of the one required in order to get a freshly ground one will, I believe, not suffer from homesickness for the old method. There are, however, some cases when special work is done in limited quantities and where it may still be necessary, or at least advisable, to have some tools ground in the shop where they are used. Generally speaking, however, the number of such jobs can be reduced to a very small minority by careful planning.

I do not agree with Mr. Brent in his definition of a machinist. Of course there are machinists, real machinists, and all around machinists and, as it is apparent, judging from the information we have available covering machinist apprenticeship training courses, that the aim of practically all manufacturers, who have courses of training in effect, is to produce all around machinists. My definition will apply only to this particular species.

The all around machinist, to my way of thinking, should be a man capable of handling any productive operation which may arise in a machine shop. This should include necessary experience which will enable him, in any case of necessity, to make a simple sketch, as well as to make the simple patterns or forgings required and to do any and all machine, bench, hand, floor and assembly work involved to put the mechanism into usable shape.

To do this the machinist should be able to figure gears, line up and set up any machine tool with its counter and line shaft and pulleys, lace and apply the required belting, as well as to forge, temper and grind the necessary tools. Any man who cannot function as outlined above to my mind should not be classified as an all around machinist. He had better be catalogued as a one-sided machinist or specialist. The millwright, bench hand, fitter, erector, machine operator and assembler come under this classification, while the title "all around machinist" should apply only to one who is an all around man or one who can "handle any job in the shop."

It is admitted that these men are mighty scarce and, as a general rule, they never have to look for a job. If, in addition to the above attainments, they possess a willingness to assume responsibility and some of that indefinable ingredient known as executive ability they usually become foremen at a comparatively early age and, perhaps later, superintendents and works managers.

The Foreman's Biggest Job

By Robert Grimshaw

The foreman's biggest job is not the understanding and handling of the machinery, the materials or the workers. Nor does it lie in understanding the methods by which these are utilized to the best advantage of all concerned—including the community. But his biggest job is the understanding and handling of his own personal equipment for his job. It is knowing his possibilities and his limitations and how to utilize the first to the fullest and how to counteract the latter. This he may learn by self-analysis and study, and sometimes by the help of "friend wife."

What's Wrong with the Railroad Shops?—III

Small Tool Situation—Lack of Co-operaton Between Mechanical and Purchasing Departments—Inadequacy of Tool-Sharpening Equipment

BROADLY SPEAKING, the tooling in the railroad shop is neglected. There are cutters and lathe tools and drills just like the ones you would find in any machine shop but they do not seem to have been selected by men who understood the requirements of the railroad shop. There seems to be little doubt that the difficulty arises from the relations existing between mechanical department and purchasing department.

The function of any mechanical department is to get out the best possible work at the least possible cost. To accomplish this end the men at the head of it are naturally anxious to get the tools and equipment best suited to the purpose, the cost of such equipment being less important than its capacity. The purchasing department on the other hand is expected to meet the requirements of the mechanical department in the way of tools and supplies at the least possible cost. Where the two departments work hand in hand, each sympathetic with the purpose of the other and willing to compromise for the good of the whole company, excellent results are possible. When the two departments are constantly at loggerheads the result is more than apt to be quite the reverse.

In the majority of railroad shops the co-operation of the purchasing department and the mechanical department leaves much to be desired and is undoubtedly responsible for many of the faults we are pointing out in these articles. We shall have more to say on this particular point, which is a management function, in a later article.

With very few exceptions the railroad shop employs no tool engineer. As a rule the work which would naturally be done by such a man is entrusted to the toolroom foreman. It is not fair to expect that a man whose experience has been entirely along the line of making things should also be a capable designer. We saw some instances where the toolroom foreman had made meritorious attempts to improve existing tools and make special tools for certain kinds of work, but in most cases these attempts showed very clearly that ambition and ingenuity were handicapped by the lack of detailed knowledge and engineering ability.

The average toolroom foreman has neither the time nor the opportunity to watch the various jobs in the shop to an extent that would enable him to form ideas as to the best method of performing a given operation or the best construction of the tool used. It is just as wrong to expect the toolroom foreman to design tools as it is to expect the master mechanic to design locomotives. Toolroom foremen have designed tools and master mechanics have designed locomotives. Perhaps that is why we have such a complete lack of standardization in both.

A visit to the largest repair shop of one important railroad system showed conditions that would be difficult to duplicate in anything but a railroad shop. At the carwheel boring machine 400 pairs of boring tools were neatly hung on pegs on two blackboards. At a slotter 460 tools were found ranging in composition from chilled cast iron to the latest high-speed steel, and in shape through all the known forms and far into the realm of the unknown. These two lots of tools had been collected gradually by the men then working on the machines and their predecessors and were conclusive proof that the practice in this particular shop had been developed entirely by the men themselves without any instructions or control from the outside.

If it is too much to expect of a toolroom foreman that he should be able to design tools, isn't it rather worse to expect the machine operator to develop his own tools and methods? Experience in production shops indicates that the development of tools and methods cannot be left in the hands of even the brightest and most energetic machine operator. Such a man is not in a position where he has the time or the facilities to do the necessary experimenting to decide on the best methods or tools, although if this same man were put at such experimental work he might perhaps prove to be exactly fitted for the task.

Stranger than the fact that many necessary tools are not made or supplied is the fact that some of the best talent in the shop is employed in making simple standard tools which can be bought in any hardware store at less than half the cost. It seems incredible that a modern shop superintendent would permit an expert blacksmith to spend his time forging cold chisels and heads for sledge hammers at a time when locomotive repairs were being delayed through lack of them, yet that was exactly what was being done in a number of shops. The blacksmith was not engaged in making a tool that was needed in a hurry, an emergency job, but was making a deliberate attempt to manufacture, for he was supplied with a good set of dies for making several sizes of chisels.

It may be that the cost record shows that the chisels can be made somewhat more cheaply at home. If so it

WHAT WAS said in the previous article about machine tools and equipment applies with equal force to small tools. Our observations led us to believe that little betterment of the small-tool situation in the railroad repair shops is to be expected until some means are found to secure co-operation between the mechanical and purchasing departments. By the very nature of things their functions are diametrically opposed and the way to get them together is through the personal intervention of the man to whom they report. It is asking a good deal of a busy official to expect him to take the time to bring about such co-operation, but it is asking entirely too much to expect his subordinates to do it if he appears not to have the interest in the problem which could cause him to devote some time to it. Where he leads they will be glad to follow.

is almost sure that the cost record is at fault, but whether these cold chisels were actually cheaper than those one can buy in the hardware store is a point of minor importance. The main thing is that a skilled man engaged in a railroad shop should not be employed in making articles which can be bought in the open market.

If the purchasing department does not honor requisitions so that the shop is habitually short of the necessary tools the shop is practically justified in helping itself in making what it needs, but this is no excuse for the company as a whole. Another excuse may be the idea that here is a skillful man for whom there is not sufficient work at present but whom one wants to retain in the organization. This situation may partly justify the shop management but certainly not the company.

In the same shop we were told that there was a rule against making parts for stock. Had such a rule not been issued the shop management could have put this man to work making articles which at one time or another would be required for the repair of locomotives or cars.

Inadequate Tool Sharpening Equipment

In most of the shops the equipment for sharpening tools was inadequate. It must be said here in fairness to the railroad shops that the same remark might be made about most other machine shops, but it is no excuse for any man's neglect that other men are equally neglectful.

Cutter sharpening unquestionably was below par. Not only was there a lack of proper equipment but what equipment there was was generally not used to the best advantage. There seemed to be an absence of knowledge as to what was required in a tool and the means to obtain it. The fact that cutters intended for the same or similar work were ground with different clearances and with and without rake, all in the same shop, shows the truth of our contention. A further investigation showed that, even if this knowledge had not been lacking, there would not have been the proper equipment to get good and uniform results. Tool grinders, it is true, were found in most of the shops visited, but there was an utter lack of uniformity of angles though the tools were to be used for the same kind of work and in the same shop.

One story we ran across has nothing to do with tool sharpening but it does bear out the statement that knowledge of what is required of a tool is lacking. This happened in one of the best-equipped and best-managed railroad shops in the country during the early days of the war. The shop had been using high-speed drills wherever possible and the men in charge were rather pleased with the results they were getting. The war, however, soon drove the price of high-speed drills to a height beyond the reach of the railroad exchequer and it was reluctantly decided to go back to carbon drills.

The change was made and some time later a check was made on the speeds and feeds of the drilling machines throughout the shop. Considerable consternation arose when it was discovered that not a single change in speeds or feeds had been made and that apparently the carbon drills were standing up in an entirely satisfactory way. Just how many thousands of dollars had been wasted by driving the high-speed drills to a fraction of their capacity will never be known but the loss is typical of many similar ones brought out through like ignorance or lack of interest. Assigning a new Pacific type locomotive to hauling two day coaches and a combination regularly on a three-mile branch line would be a money-saving proposition compared to it.

Another evidence of the insufficient or inefficient sharpening equipment was the condition of the reamers, boring tools and similar precision tools. They were neither round nor sharp nor ground to any definite size. This condition we are glad to say was by no means universal. In some of the shops equipment of this nature was kept in excellent condition. While we are on the subject of reamers we might mention one odd fact about bridge reamers. Although it is well established that a ground bridge reamer lasts many times as long as one that is used in the rough, most shops seem to buy them unground.

Jigs and fixtures are conspicuous by their absence and those that are in use are pretty primitive. The lack of such essential parts of the equipment of manufacturing plants may be explained, at least partly, by the fact that railroad shops do not make parts in quantity. Jigs and fixtures, however, are not used merely for the purpose of reducing the cost of things but also to make them better and particularly to make them interchangeable. Though the cost of the piece itself might not have been lessened, interchangeability reduces the cost of its installing in the finished product.

We shall have more to say about the lack of standardization but it should be mentioned here that many things are done which could be done better if there were more uniformity of parts. Connecting rod brasses, for example, are laboriously shaped instead of being quickly milled because, so it is said, there are too many sizes to warrant the use of such costly tools as milling cutters. There is no question that many sizes are in use but that so many sizes are necessary is very doubtful.

There seems to be a general lack of appreciation of the necessity of studying operations and applying the best method available. There are a few operations which have been specialized and for which special machines or tools have been built, wheel and axle lathes for example, but on the whole little attention seems to be paid to the proper method of machining, the idea being that anything goes so long as the piece is ready when needed.

Few Jigs and Fixtures Used

An extreme example came to our notice in one of the shops, a shop by the way where the equipment was much above the average. The job was the boring of a cylindrical piece of steel which had been turned up. The hole was lengthwise with the piece which was about 5 in. in diameter and 10 in. long. The piece was clamped in an upright position against an angle plate fastened to the bed of a radial drill and a 2-in. drill did the roughing out. No jig was used although the hole was supposed to be central with the piece. A good boring bar was used for finishing but most of its accuracy was dissipated through the uncertain and wobbly connection between it and the spindle of the machine. It is difficult to imagine a worse method.

From what has gone before it may be guessed, what we found to be a fact, that instructions to the men were at most scanty, and generally missing altogether. Operations were performed according to traditional methods. Only in scattered cases had an operation been standardized and records made of it. Perhaps records existed in such cases but if so there was not sufficient contact

between the engineering department and the shop to put these records to work.

In one shop where most of the equipment was modern a large planer was out of action. The feed blocks had to be removed for repairs. After spending a good deal of time on false starts the man who had worked on it found that a large part of the driving mechanism, pulleys, pulley shaft, pulley shaft outboard bearing, some gears and other shafts had to be removed before he could remove the feed box. He had spent several days in fruitless efforts to handle it some other way and had just discovered the necessity of removing all the parts mentioned.

We asked him, "Didn't you have a blueprint of the machine or a foundation plan?"

The answer was, "No."

"Isn't there such a blueprint in the shop?"

Answer, "I don't know."

"Did you ask your foreman?"

"No."

"Didn't he tell you something about it?"

"No, he didn't."

Now it may very well be that such a blueprint existed in the engineering department. If so it would have given the necessary information and a lot of useless work would have been saved. Here was an utter lack of instruction and it seems likely also that the foreman was ignorant that such a blueprint could be had. Whether the blue print existed or not is immaterial because no attempt was made to ascertain the facts and no instructions were given to the workman except to "fix up" the machine.

This situation calls to mind the ancient army story about the flag pole. An instructor asked his class of cadets how they would proceed to erect a flag pole of given dimensions in a given spot. After much thought various more or less ingenious answers were evolved. The instructor listened to all of them and then said, "You are all wrong. You would simply say, 'Sergeant, put up that flag pole.'" This plan of operation is a very simple one for the army officer or the shop foreman, but it has its drawbacks from the point of view not only of the sergeant and the workman but as an efficient performance.

There are, of course, many men in the railroad shop who are good and faithful and willing to work but who are not exactly college professors or mechanical engineers and who are at their best only when properly instructed. There are other men, not so many perhaps, who have the mental equipment and initiative to strike out for themselves along new paths but who cannot possibly turn their gifts to the best advantage unless they are given the tools and equipment necessary to turn out a good job.

Here again the close contact between the management and the men necessary to produce results seems to be lacking. It is not that the management is standing aloof from the men but that the idea seems to prevail that the men should know what needs to be done and that they actually do know so that instructions would be superfluous and might possibly hurt the feelings of the man. It is needless to say that the feelings of a good man are never hurt when he is instructed in the proper way.

Sash Weights and Machine Tools

By Charles W. Lee

The *American Machinist* has recently, much to my gratification, published a mighty fine little booklet, "Machine Tools and the Machines They Build," which exposes a false idea that I have long been fighting, that of considering the value of machine tools in terms of weight.

I hope this booklet will accomplish more than I have; this "how much a pound" idea is so firmly established that my converts total only two among those who have been looking at the matter from the buyer's viewpoint.

One of the converts was the superintendent of a large plant making small low-priced steam engines who said that he had to figure his stuff by the pound and that there was no reason why machine tools shouldn't be so figured. Explanations that the more skilled labor put into a certain weight of material the harder and more undesirable it was to sell it by the pound were of no avail. He said:

"I keep my sizes just as close as any machine tool maker in the world. I admit it is not necessary to the working of the engines, but I more than make it up in economy of assembling" (a point which might well be considered in some places I know of). "Come with me; I'll show you something."

And I did and he did. What he showed was a first class measuring machine. "There," he said, "we can easily measure to the ten thousandth part of an inch on that machine." And he mentioned the cost, which ran into thousands of dollars.

"And how much does it weigh?" I softly asked. And that converted *him*!

The other convert was the president of a somewhat similar concern who did not make as much of a point of what his product cost per pound, as he did of the price per pound of a machine that was being offered him and alleged to be every bit as good as the one I was offering. At the end of a (perfect) day of periodical battles, he said:

"We will have a directors' meeting at 9 a.m. tomorrow. Come around."

At the meeting the battle raged until the president said, "What will you do if we absolutely refuse to pay your price?"

"Take the next train out of town; what time does it leave?"

"Eleven o'clock."

Looking at my watch, shaking it, holding it to my ear, and trying, evidently with success, to achieve an expression of chagrin and dismay, I said:

"What time is it anyhow?"

The president pulled out a very nice looking watch. "Nine-thirty."

"Are you *sure* your watch is right? Is it a *good* watch?"

The president began to get a little peeved: "Bet your life it's a good watch. I paid two hundred and fifty for it!"

"How much a pound was that?"

And so the directors gave the president the "ha, ha" and me the order. Yes, they really did, although I hate to mention it on account of confessing the harmless chicanery in the matter of my watch, which the astute reader knows was running merrily along all the time.

I've had two converts but I want more.

Learning the Trade Forty Years Ago

N. S. DAVENPORT

(The last of four articles)

The means for spacing the carriage forward at the end of each cycle was peculiar. A smooth round shaft extended the whole length of the machine under the carriage, and this shaft was given an intermittent endwise movement by means of a suitable cam. The amplitude of the movement was adjustable to suit different pitches of the beam.

A fixed boss on the underside of the carriage, through which the shaft passed, was provided with a grip that could be closed upon the shaft or released to allow the shaft to slide freely through it, the grip being operated by a separate cam. When the log was carrying the work across the cutter the carriage was tightly gripped to the shaft, which was at this moment stationary; but when the oscillating movement had ceased the grip was released and the shaft moved back to its limit. The carriage grip would then close and the shaft would move forward, carrying with it the entire carriage with the work upon it. Other and later machines for the same purpose were provided with screw and ratchet mechanisms for indexing, but this old machine did excellent work.

"Sealing" the Scale Beams

All the beams were, however, subjected to a later operation known as "sealing," performed after the scales were assembled. To do this the sealer would first place the poise in the zero notch and adjust the scale to bring the beam into balance. He would then place a standard weight upon the platform of the scale and move the poise one notch forward. If the beam did not then balance he would file the notch forward or backward as the position of the beam indicated until it did. This operation would then be continued by adding weights to the platform and correcting each notch as required to the end of the beam.

Setting the pivots in these large scale beams was quite an exacting job. The pivots were of square-sectioned steel, necessitating a square hole and a nice fit in the beam. A hole, equal in diameter to the measurement across the flats of the pivots would first be drilled in the beam and then filed nearly to the required size and shape, after which a square broach was forced through it.

The pivots were hand-forged and finished to size by filing. They were also slightly tapered to insure a tight fit in the beam. A pivot would be driven part way through the hole and then tested for "squareness" and position and if any error was disclosed by this test the pivot would be forced out and the error corrected by filing. This was really fine work and was done by some of the most skilled men in the shop.

Grinding the Cutters

One of my jobs in the toolroom was to grind the cutters used for cutting the notches in the beams. These cutters were perhaps 5 in. in diameter by about ¼ in. thick at the center, tapering somewhat toward the periphery where the teeth were shaped to conform to the contour of the notches. The arbor holes were parallel and were not chambered in the middle as is now the common practice; nor were the holes ground after hardening.

In the cutter grinding machine the cutters were placed on a fixed bar and slid past the wheel by the operator's fingers. If the center hole was not round neither would the periphery be round; and, as I had received little instruction as to the manner of grinding and had not been impressed with the need for care and accuracy, I suspected that some of the cutters I ground were no better than they should have been. Also, with the grade of wheels we used in those days many of the teeth were softened by the heat of grinding, though I always took care to grind away the tell-tale blue that would have disclosed this condition.

The tool room was equipped with a good Pratt & Whitney lathe, but I was not allowed to use it much, although on occasions I would escape the vigilant eye of the boss and try my hand at it. It was with the help of this lathe that I built my first automatic machine.

My First Automatic Machine

One of the jobs that was delegated to the "kid" in the toolroom was the making of the little "fish-hooks" of iron wire with which the molders in the foundry suspended the pivots in the molds when castings were being made that required the pivots to be cast in. It was a tedious and monotonous job to bend hundreds of the little hooks, all alike, with no tools other than the bare fingers and a pair of round-nose pliers, so I devised a way to do it by machinery.

I took an 8-lb. scale weight, smoothed off one side flat for the base of my machine and fastened to it suitably shaped pieces of steel to form the hook. The movable part of the former was attached to a short lever that was fulcrumed on the base, so that by placing the short pieces of wire and pulling the lever I would get a completed hook in one movement.

This was good as far as it went and far better than the hand and plier method; but I would always rather turn a crank than pull a lever so later I added another part, made from a sewing machine balance wheel with a pitman attached to the lever, so that I could turn the crank continuously with one hand while feeding in the short wires with the other.

Improvements Suggested

One of the men, Powers by name, who had previously worked in the toolroom and had special privileges there, became interested in my device and suggested further improvements. Together we worked out and built a crank and ratchet device by means of which the wire would be fed in from a coil and cut off automatically. When this had been accomplished, a round belt from the line shaft to the balance wheel added the final touch and I was an inventor, with my first automatic machine in actual operation.

I have designed and built many and complicated automatic machines since that day, but never one that gave me greater pride than I experienced when I first saw this crude little device performing so quickly and easily the work that had been so monotonous when done by hand. I suspect that a streak of laziness in my make-up has been responsible for my tendency toward automatic machinery, for I would far rather lean my elbows on a drawing board and plan out levers, gear trains, and mechanical movements than to work—even now.

And after all, has not the world advanced more because of this desire to save labor than from any other single cause? Chopping down trees may be good exercise for ex-Kaisers but a sawmill is of greater use to the world at large.

Commercial Standards

As Adopted by The Tap and Die Institute

(12 TABLES)

TABLE 1
Dimensions of Standard Hand Taps

Diam. of Tap Inches*	Length, Inches		Diam. of Shank Inches	Size of Square Inches	Diam. of Tap Inches	Length, Inches		Diam. of Shank Inches	Size of Square Inches
	Thread	Overall				Thread	Overall		
1/4	1	2 1/2	.2530	.1897	1 3/4	2 1/16	5 3/4	1.0215	.7661
5/16	1	2 1/2	.2686	.2015	1 13/16	2 1/16	5 3/4	1.0527	.7895
3/8	1	2 1/2	.2843	.2132	1 7/8	2 1/16	5 3/4	1.0840	.8130
7/16	1	2 1/2	.2999	.2249	1 15/16	3	6 1/16	1.1083	.8312
1/2	1 1/16	2 5/16	.3155	.2366	1 15/16	3	6 1/16	1.1395	.8546
9/16	1 1/16	2 5/16	.3311	.2483	1 15/16	3	6 1/16	1.1708	.8781
5/8	1 1/8	2 5/16	.3468	.2601	1 15/16	3	6 3/8	1.2333	.9250
11/16	1 1/8	2 5/16	.3624	.2718	1 15/16	3	6 3/8	1.2645	.9484
3/4	1 1/4	2 1/16	.3785	.2839	1 15/16	3 1/16	6 11/16	1.3050	.9787
13/16	1 1/4	2 1/16	.3941	.2956	1 15/16	3 1/16	6 11/16	1.3362	1.0021
7/8	1 1/4	2 1/16	.4098	.3074	1 15/16	3 1/16	7	1.4300	1.0725
15/16					1 15/16	3 1/16	7	1.4612	1.0959
1	1 1/4	2 1/16	.2750	.2062	1 7/8	3 1/16	7 1/16	1.5195	1.1396
1 1/16	1 1/4	2 1/16	.2906	.2179	1 7/8	3 1/16	7 1/16	1.5507	1.1630
1 1/8	1 1/4	2 1/16	.3062	.2296	2	3 1/16	7 5/8	1.6445	1.2334
1 3/16	1 1/4	2 1/16	.3218	.2414	2 1/16	3 1/16	7 5/8	1.6757	1.2568
1 1/4	1 5/16	2 1/8	.3232	.2424	2 1/16	3 1/16	8	1.7694	1.3271
1 5/16	1 5/16	2 1/8	.3388	.2541	2 1/16	3 1/16	8	1.8007	1.3505
1 3/8	1 5/16	2 1/8	.3541	.2658	2 1/16	3 1/16	8 1/4	1.8941	1.4208
1 7/16	1 5/16	2 1/8	.3700	.2775	2 1/16	3 1/16	8 1/4	1.9257	1.4443
1 1/2	1 5/16	2 1/8	.3667	.2750	2 1/16	4	8 1/2	2.0194	1.5146
1 9/16	1 5/16	2 1/8	.3823	.2867	2 1/16	4	8 1/2	2.0507	1.5380
1 5/8	1 5/16	2 1/8	.3979	.2984	2 1/16	4	8 3/4	2.1000	1.5750
1 11/16	1 5/16	2 1/8	.4135	.3101	2 1/16	4	8 3/4	2.1313	1.5984
1 3/4	1 5/16	2 1/8	.4292	.3219	2 1/16	4	8 3/4	2.2250	1.6687
1 13/16	1 5/16	2 1/8	.4448	.3336	2 1/16	4	8 3/4	2.2563	1.6922
1 7/8	1 5/16	2 1/8	.3823	.2867	2 1/16	4	9 1/4	2.3500	1.7625
1 15/16	1 5/16	2 1/8	.4604	.3453	2 1/16	4	9 1/4	2.3813	1.7859
2	1 5/16	2 1/8	.4760	.3570	2 1/16	4	9 1/4	2.4750	1.8562
2 1/16	1 5/16	2 1/8	.4952	.3714	2 1/16	4	9 1/4	2.5063	1.8797
2 1/8	1 5/16	2 1/8	.5108	.3831	3	4 1/16	9 3/4	2.5429	1.9072
2 3/16	1 5/16	2 1/8	.5421	.4066	3 1/16	4 1/16	9 3/4	2.5742	1.9306
2 1/4	1 5/16	2 1/8	.5733	.4300	3 1/16	4 1/16	9 3/4	2.6679	2.0009
2 5/16	1 5/16	2 1/8	.5900	.4425	3 1/16	4 1/16	9 3/4	2.6992	2.0244
2 3/8	1 5/16	2 1/8	.6212	.4659	3 1/4	4 1/16	10	2.7929	2.0946
2 7/16	1 5/16	2 1/8	.6525	.4891	3 1/16	4 1/16	10	2.8242	2.1181
2 1/2	1 5/16	2 1/8	.6837	.5128	3 1/16	4 1/16	10	2.8827	2.1620
2 9/16	1 5/16	2 1/8	.6973	.5230	3 1/16	4 1/16	10	2.9140	2.1855
2 5/8	1 5/16	2 1/8	.7285	.5464	3 1/16	4 1/16	10 1/4	3.0077	2.2557
2 11/16	1 5/16	2 1/8	.7598	.5698	3 1/16	4 1/16	10 1/4	3.0390	2.2792
2 3/4	1 5/16	2 1/8	.7910	.5932	3 1/16	4 1/16	10 1/4	3.1327	2.3495
2 13/16	1 5/16	2 1/8	.8000	.6000	3 1/16	4 1/16	10 1/4	3.1640	2.3730
2 7/8	1 5/16	2 1/8	.8312	.6234	3 1/16	5 1/16	10 1/2	3.2167	2.4125
2 15/16	1 5/16	2 1/8	.8625	.6469	3 1/16	5 1/16	10 1/2	3.2479	2.4359
3	1 5/16	2 1/8	.8965	.6724	3 1/16	5 1/16	10 1/2	3.3417	2.5062
3 1/16	1 5/16	2 1/8	.9277	.6958	3 1/16	5 1/16	10 1/2	3.3729	2.5297
3 1/8	1 5/16	2 1/8	.9590	.7192	4	5 1/16	10 3/4	3.4667	2.6000

NOTE — For Tolerances, see Table 3
For Fine Pitch Taps over 1½" see Table 2

TABLE 2
Dimensions of Special Hand Taps Over 1½" Diameter Having 10 or More Threads per Inch

Diameter of Tap Inches	Length, Inches		Diameter of Shank Inches	Size of Square Inches
	Thread	Overall		
1 5/8	2	5	1.3050	.9787
1 3/4	2	5	1.4300	1.0725
1 7/8	2	5	1.5195	1.1396
2	2	5	1.6445	1.2334
2 1/8	2	5 1/4	1.7695	1.3271
2 1/4	2	5 1/4	1.8944	1.4208
2 3/8	2	5 1/4	2.0194	1.5146
2 1/2	2	5 1/4	2.1000	1.5750
2 5/8	2	5 1/2	2.2250	1.6687
2 3/4	2	5 1/2	2.3500	1.7625
2 7/8	2	5 1/2	2.4750	1.8562
3	2	5 1/2	2.5429	1.9072
3 1/8	2	5 3/4	2.6679	2.0009
3 1/4	2	5 3/4	2.7929	2.0946
3 3/8	2	5 3/4	2.8827	2.1620
3 1/2	2	5 3/4	3.0077	2.2557
3 5/8	2	6	3.1327	2.3495
3 3/4	2	6	3.2167	2.4125
3 7/8	2	6	3.3417	2.5062
4	2	6	3.4667	2.6000

Diameter of Shank and size of square are same as for Standard Hand Taps. (See Table 1.)

Tolerances for All Hand Taps

Length overall, ¼" to 1 13/16" incl.	plus or minus 1/32"
Length overall, 1 15/16" to 4" incl.	plus or minus 1/16"
Length of thread	plus or minus 3/32"
Diameter of shank to 1" incl.	size to size minus .005"
Diameter of shank 1 1/16" to 2" incl.	size to size minus .007"
Diameter of shank over 2"	size to size minus .009"
Size of square, ½" and smaller	size to size minus .004"
Size of square, 9/16" to 1" incl.	size to size minus .006"
Size of square, 1 1/16" to 2" incl.	size to size minus .008"
Size of square, 2 1/16" to 4" incl.	size to size minus .010"

Formulae

Diameter of shank = O. D. of tap — (Std. "V" Pitch × 1.6)
Size of square = Diameter of shank × .75

SEVERAL YEARS ago The Tap and Die Institute realized that there was a definite demand among the users of taps and dies for a greater degree of uniformity in these tools. Work was commenced and as a result a number of standard tables have been prepared and adopted. A number of the more important ones are presented on this and the following pages. Many other standardized dimensions of taps and dies can be found

TABLE 3
Dimensions of Pipe Taps

Nominal Sizes Inches	Length, Inches: Thread	Length, Inches: Overall	Diam. of Shank Inches	Size of Square Inches	Dist. Small End of Briggs Std. Tap Projects through Gauge	Pitch Diam. of Straight Pipe Taps, Inches: Basic	Minimum	Maximum
1/8	3/4	2 1/8	.3125	.234	.312	.3748	.3733	.3763
			.4375	.328				
1/4	1 1/16	2 1/16	.4375	.328	.459	.4899	.4884	.4914
			.5625	.421				
3/8	1 1/16	2 3/16	.5625	.421	.454	.6270	.6253	.6288
			.7000	.531				
1/2	1 3/8	3 1/8	.6875	.515	.579	.7784	.7767	.7802
			.8650	.640				
3/8	1 3/8	3 1/16	.8125	.594	....	.....	.....	.....
			.9270	.687				
3/4	1 3/8	3 1/4	.9063	.679	.565	.9889	.9869	.9909
			1.0750	.812				
7/8	1 5/16	3 1/2	1.0937	.812	....	.....	.....	.....
1	1 3/4	3 3/4	1.1250	.843	.678	1.2386	1.2366	1.2406
1 1/4	1 3/4	4	1.3125	.984	.686	1.5834	1.5811	1.5856
1 1/2	1 3/4	4 1/4	1.5000	1.125	.699	1.8223	1.8201	1.8246
1 3/4	1 3/4	4 3/8	1.6250	1.218	....	.....	.....	.....
2	1 3/4	4 1/2	1.8750	1.406	.667	2.2963	2.2938	2.2988
2 1/4	2 1/8	5	2.0000	1.500	....	.....	.....	.....
2 1/2	2 5/16	5 1/2	2.2500	1.687	.925	2.7622	2.7594	2.7649
2 3/4	2 5/16	5 3/4	2.3750	1.781	....	.....	.....	.....
3	2 5/8	6	2.6250	1.968	.925	3.3855	3.3858	3.3913
3 1/4	2 5/8	6 1/4	2.7500	2.062	....	.....	.....	.....
3 1/2	2 11/16	6 1/2	2.8125	2.108	.938	3.8888	3.8861	3.8916
3 3/4	2 11/16	6 5/8	2.8750	2.156	....	.....	.....	.....
4	2 3/4	6 3/4	3.0000	2.250	.950	4.3871	4.3844	4.3899

Tolerances

Length overall, 1/8" to 3/4" incl.	plus or minus 1/32"
Length overall, 7/8" to 4" incl.	plus or minus 1/16"
Length of thread	plus or minus 1/64"
Diameter of shank to 1/2" incl.	size to size minus .007"
Diameter of shank over 1/2"	size to size minus .009"
Size of square to 1/2" incl.	size to size minus .006"
Size of square over 1/2"	size to size minus .010"
Distance projecting through gauge, 1/8" to 3/4" incl.	plus or minus 1/16"
Distance projecting through gauge, 1" to 3" incl.	plus or minus 3/32"
Distance projecting through gauge, 3 1/2" and over	plus or minus 1/8"

TABLE 4
Dimensions of Taps for Nos. 2 1/2 and 3 Beaman & Smith Holders

Diameter of Tap Inches	For No. 2 1/2 Holder: Length of Thread	Length Overall	Diam. of Shank	For No. 3 Holder: Length of Thread	Length Overall	Diam. of Shank
1	2 1/2"	6 3/4"	1 1/2"	...	...	...
1 1/16	2 1/2"	6 3/4"	1 1/2"	...	...	...
1 1/8	2 1/2"	6 3/4"	1 1/2"	...	...	...
1 3/16	2 1/2"	6 3/4"	1 1/2"	...	...	...
1 1/4	2 5/8"	7"	1 1/2"	2 5/8"	7 1/4"	1 5/8"
1 5/16	2 5/8"	7"	1 1/2"	2 5/8"	7 1/4"	1 5/8"
1 3/8	2 3/4"	7 1/4"	1 1/2"	2 3/4"	7 1/2"	1 5/8"
1 7/16	2 3/4"	7 1/4"	1 1/2"	2 3/4"	7 1/2"	1 5/8"
1 1/2	2 7/8"	7 1/2"	1 1/2"	2 7/8"	7 3/4"	1 5/8"
1 5/8	3"	7 3/4"	1 1/2"	3"	8"	1 5/8"
1 3/4	3 1/8"	8"	1 1/2"	3 1/8"	8 1/4"	1 5/8"
1 7/8	3 1/4"	8 1/4"	1 1/2"	3 1/4"	8 1/2"	1 5/8"
2	3 3/8"	8 1/2"	1 1/2"	3 3/8"	8 3/4"	2"
2 1/8	...	...	...	3 1/2"	9"	2"
2 1/4	...	...	...	3 5/8"	9 1/4"	2"
2 3/8	...	...	...	3 3/4"	9 1/2"	2"
2 1/2	...	...	...	3 7/8"	9 3/4"	2"

Dimensions of Pipe Taps for Beaman & Smith Holders

Size Pipe	Fitting Holder Number	Diameter Shank Inches	Length Thread Inches	Length Overall Inches
1/8"	1	1/2	3/4	2 3/16
1/4"	1	1/2	1 1/16	2 1/8
3/8"	2	3/4	1 1/16	3 3/16
1/2"	2	3/4	1 3/8	3 7/8
3/4"	2	3/4	1 3/8	3 7/8
1"	2 1/2	1 1/2	1 3/4	5
1 1/4"	2 1/2	1 1/2	1 3/4	5
1 1/2"	2 1/2	1 1/2	1 3/4	5
2"	3	2	1 3/4	6
2 1/2"	3	2	2 3/16	6 1/16
3"	3	2	2 3/16	6 7/8

in the trade catalogs of the members of the Institute. The work of standardization is continually going on and from time to time additional tables will doubtless be made available in published form by the Institute.

The Tap and Die Institute was formed several years ago with the primary object of bringing about a greater degree of physical uniformity in taps and dies and, in general, so to standardize the dimensions of taps and

TABLE 5

Commercial Tolerances for Hand Taps, Pulley Taps and Taps for B. & S. Holder United States Standard

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D.	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
¼–20	.2500	.2175	.0010	.0035	.0025	.0005	.0025	.0020
5/16–18	.3125	.2764	.0010	.0035	.0025	.0005	.0025	.0020
3/8–16	.3750	.3344	.0010	.0035	.0025	.0005	.0025	.0020
7/16–14	.4375	.3911	.0010	.0040	.0030	.0005	.0030	.0025
½–13	.5000	.4500	.0010	.0040	.0030	.0005	.0030	.0025
9/16–12	.5625	.5084	.0010	.0040	.0030	.0005	.0030	.0025
5/8–11	.6250	.5660	.0010	.0040	.0030	.0005	.0030	.0025
¾–10	.7500	.6851	.0010	.0050	.0040	.0005	.0035	.0030
7/8– 9	.8750	.8028	.0010	.0050	.0040	.0005	.0035	.0030
1 – 8	1.0000	.9188	.0010	.0050	.0040	.0005	.0035	.0030
1⅛– 7	1.1250	1.0322	.0015	.0060	.0045	.0005	.0040	.0035
1¼– 7	1.2500	1.1572	.0015	.0060	.0045	.0005	.0040	.0035
1⅜– 6	1.3750	1.2668	.0015	.0060	.0045	.0005	.0040	.0035
1½– 6	1.5000	1.3918	.0015	.0060	.0045	.0005	.0040	.0035
1⅝– 5½	1.6250	1.5069	.0015	.0070	.0055	.0010	.0050	.0040
1¾– 5	1.7500	1.6201	.0015	.0070	.0055	.0010	.0050	.0040
1⅞– 5	1.8750	1.7451	.0015	.0070	.0055	.0010	.0050	.0040
2 – 4½	2.0000	1.8557	.0015	.0070	.0055	.0010	.0050	.0040
2⅛– 4½	2.1250	1.9807	.0020	.0080	.0060	.0010	.0055	.0045
2¼– 4½	2.2500	2.1057	.0020	.0080	.0060	.0010	.0055	.0045
2⅜– 4	2.3750	2.2126	.0020	.0080	.0060	.0010	.0055	.0045
2½– 4	2.5000	2.3376	.0020	.0080	.0060	.0010	.0055	.0045
2⅝– 4	2.6250	2.4626	.0020	.0090	.0070	.0010	.0060	.0050
2¾– 4	2.7500	2.5876	.0020	.0090	.0070	.0010	.0060	.0050
2⅞– 3½	2.8750	2.6894	.0020	.0090	.0070	.0010	.0060	.0050
3 – 3½	3.0000	2.8144	.0020	.0090	.0070	.0010	.0060	.0050

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Taps with pitch coarser than S. A. E. Standard will take U. S. Standard tolerances. Those with pitch finer than S. A. E. Standard will take S. A. E. Standard tolerances.

TABLE 6

Commercial Tolerances for Hand Taps and Taps for B. & S. Holder S. A. E. Standard

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D.	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
¼–28	.2500	.2268	.0010	.0035	.0025	.0005	.0020	.0015
5/16–24	.3125	.2854	.0010	.0035	.0025	.0005	.0020	.0015
3/8–24	.3750	.3479	.0010	.0035	.0025	.0005	.0020	.0015
7/16–20	.4375	.4050	.0010	.0040	.0030	.0005	.0025	.0020
½–20	.5000	.4675	.0010	.0040	.0030	.0005	.0025	.0020
9/16–18	.5625	.5264	.0010	.0040	.0030	.0005	.0025	.0020
5/8–18	.6250	.5889	.0010	.0040	.0030	.0005	.0025	.0020
11/16–16	.6875	.6469	.0010	.0050	.0040	.0005	.0030	.0025
¾–16	.7500	.7094	.0010	.0050	.0040	.0005	0030	.0025
7/8–14	.8750	.8286	.0010	.0050	.0040	.0005	.0030	.0025
7/8–18	.8750	.8389	.0010	.0050	.0040	.0005	.0030	.0025
1 –14	1.0000	.9536	.0010	.0050	.0040	.0005	.0030	.0025
1⅛–12	1.1250	1.0709	.0015	.0060	.0045	.0005	.0035	.0030
1¼–12	1.2500	1.1959	.0015	.0060	.0045	.0005	.0035	.0030
1⅜–12	1.3750	1.3209	.0015	.0060	.0045	.0005	.0035	.0030
1½–12	1.5000	1.4459	.0015	.0060	.0045	.0005	.0035	.0030

***TAPS OVER 1½″ WITH 10 OR MORE THREADS PER INCH**

Size	Tap Measurements					
	O. D.			P. D.		
	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
1⅝″ to 2″ incl.	.0015	.0060	.0045	.0005	.0035	.0030
2⅛″ to 3″ incl.	.0015	.0060	.0045	.0005	.0040	.0035
3⅛″ to 4″ incl.	.0015	.0070	.0055	.0005	.0050	.0045

*For taps over 1½″ with less than 10 threads per inch use tolerances for U. S. S. Taps.

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Taps with pitch coarser than S. A. E. Standard will take U. S. Standard tolerances. Those with pitch finer than S. A. E. Standard will take S. A. E. Standard tolerances.

dies as better to serve the interests of ultimate users, and bring these products into closer conformity to the standards adopted from time to time in many of the other branches of the iron and steel-working industry. This work has been in constant progress under the direct supervision of a committee on standards whose work in turn is passed upon by the members of the Institute before it is adopted and cataloged as standard.

TABLE 7

Commercial Tolerances for Machine Screw Taps

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D.	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
0–80	.060	.0519	.0010	.0025	.0015	.0005	.0015	.0010
1–56	.073	.0614	.0010	.0025	.0015	.0005	.0015	.0010
64	.073	.0629	.0010	.0025	.0015	.0005	.0015	.0010
72	.073	.0640	.0010	.0025	.0015	.0005	.0015	.0010
2–56	.086	.0744	.0010	.0025	.0015	.0005	.0015	.0010
64	.086	.0759	.0010	.0025	.0015	.0005	.0015	.0010
3–48	.099	.0855	.0010	.0025	.0015	.0005	.0015	.0010
56	.099	.0874	.0010	.0025	.0015	.0005	.0015	.0010
4–32	.112	.0917	.0010	.0030	.0020	.0005	.0020	.0015
36	.112	.0940	.0010	.0030	.0020	.0005	.0020	.0015
40	.112	.0958	.0010	.0030	.0020	.0005	.0020	.0015
48	.112	.0985	.0010	.0030	.0020	.0005	.0020	.0015
5–36	.125	.1070	.0010	.0030	.0020	.0005	.0020	.0015
40	.125	.1088	.0010	.0030	.0020	.0005	.0020	.0015
44	.125	.1102	.0010	.0030	.0020	.0005	.0020	.0015
6–32	.138	.1177	.0010	.0030	.0020	.0005	.0020	.0015
36	.138	.1200	.0010	.0030	.0020	.0005	.0020	.0015
40	.138	.1218	.0010	.0030	.0020	.0005	.0020	.0015
7–30	.151	.1294	.0010	.0030	.0020	.0005	.0020	.0015
32	.151	.1307	.0010	.0030	.0020	.0005	.0020	.0015
36	.151	.1330	.0010	.0030	.0020	.0005	.0020	.0015
8–30	.164	.1423	.0010	.0030	.0020	.0005	.0020	.0015
32	.164	.1437	.0010	.0030	.0020	.0005	.0020	.0015
36	.164	.1460	.0010	.0030	.0020	.0005	.0020	.0015
40	164	.1478	.0010	.0030	.0020	.0005	.0020	.0015
9–24	.177	.1499	.0010	.0030	.0020	.0005	.0020	.0015
30	.177	.1553	.0010	.0030	.0020	.0005	.0020	.0015
32	.177	.1567	.0010	.0030	.0020	.0005	.0020	.0015

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

TABLE 7
(CONCLUDED)

Commercial Tolerances for Machine Screw Taps

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D.	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
10–24	.190	.1629	.0010	.0030	.0020	.0005	.0020	.0015
28	.190	.1668	.0010	.0030	.0020	.0005	.0020	.0015
30	.190	.1684	.0010	.0030	.0020	.0005	.0020	.0015
32	.190	.1697	.0010	.0030	.0020	.0005	.0020	.0015
12–24	.216	.1889	.0010	.0030	.0020	.0005	.0020	.0015
28	.216	.1928	.0010	.0030	.0020	.0005	.0020	.0015
32	.216	.1957	.0010	.0030	.0020	.0005	.0020	.0015
14–20	.242	.2095	.0010	.0035	.0025	.0005	.0025	.0020
24	.242	.2149	.0010	.0035	.0025	.0005	.0025	.0020
16–18	.268	.2319	.0010	.0035	.0025	.0005	.0025	.0020
20	.268	.2355	.0010	.0035	.0025	.0005	.0025	.0020
22	.268	.2385	.0010	.0035	.0025	.0005	.0025	.0020
18–18	.294	.2579	.0010	.0035	.0025	.0005	.0025	.0020
20	.294	.2615	.0010	.0035	.0025	.0005	.0025	.0020
20–16	.320	.2794	.0010	.0035	.0025	.0005	.0025	.0020
18	.320	.2839	.0010	.0035	.0025	.0005	.0025	.0020
20	.320	.2875	.0010	.0035	.0025	.0005	.0025	.0020
22–16	.346	.3054	.0010	.0035	.0025	.0005	.0025	.0020
18	.346	.3099	.0010	.0035	.0025	.0005	.0025	.0020
24–16	.372	.3314	.0010	.0035	.0025	.0005	.0025	.0020
18	.372	.3359	.0010	.0035	.0025	.0005	.0025	.0020
26–14	.398	.3516	.0010	.0040	.0030	.0005	.0030	.0025
16	.398	.3574	.0010	.0040	.0030	.0005	.0030	.0025
28–14	.424	.3776	.0010	.0040	.0030	.0005	.0030	.0025
16	.424	.3834	.0010	.0040	.0030	.0005	.0030	.0025
30–14	.450	.4036	.0010	.0040	.0030	.0005	.0030	.0025
16	.450	.4094	.0010	.0040	.0030	.0005	.0030	.0025

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

TABLE 8

Commercial Tolerances for Nut and Tapper Taps United States Standard

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D.	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
¼–20	.2500	.2175	.0020	.0050	.0030	.0015	.0010	.0025
5/16–18	.3125	.2764	.0020	.0050	.0030	.0015	.0040	.0025
⅜–16	.3750	.3344	.0020	.0050	.0030	.0015	.0010	.0025
7/16–14	.4375	.3911	.0020	.0060	.0040	.0015	.0045	.0030
½–13	.5000	.4500	.0020	.0060	.0040	.0015	.0045	.0030
9/16–12	.5625	.5084	.0025	.0065	.0040	.0020	.0050	.0030
⅝–11	.6250	.5660	.0025	.0065	.0040	.0020	.0050	.0030
¾–10	.7500	.6851	.0025	.0070	.0045	.0020	.0055	.0035
⅞– 9	.8750	.8028	.0025	.0070	.0045	.0020	.0055	.0035
1 – 8	1.0000	.9188	.0025	.0070	.0045	.0020	.0055	.0035
1⅛– 7	1.1250	1.0322	.0030	.0080	.0050	.0025	.0065	.0040
1¼– 7	1.2500	1.1572	.0030	.0080	.0050	.0025	.0065	.0040
1⅜– 6	1.3750	1.2668	.0030	.0080	.0050	.0025	.0065	.0040
1½– 6	1.5000	1.3918	.0030	.0080	.0050	.0025	.0065	.0040
1⅝– 5½	1.6250	1.5069	.0030	.0090	.0060	.0025	.0070	.0045
1¾– 5	1.7500	1.6201	.0030	.0090	.0060	.0025	.0070	.0045
1⅞– 5	1.8750	1.7451	.0030	.0090	.0060	.0025	.0070	.0045
2 – 4½	2.0000	1.8557	.0030	.0090	.0060	.0025	.0070	.0045
2⅛– 4½	2.1250	1.9807	.0040	.0110	.0070	.0030	.0080	.0050
2¼– 4½	2.2500	2.1057	.0040	.0110	.0070	.0030	.0080	.0050
2⅜– 4	2.3750	2.2126	.0040	.0110	.0070	.0030	.0080	.0050
2½– 4	2.5000	2.3376	.0040	.0110	.0070	.0030	.0080	.0050
2⅝– 4	2.6250	2.4626	.0040	.0120	.0080	.0030	.0085	.0055
2¾– 4	2.7500	2.5876	.0040	.0120	.0080	.0030	.0085	.0055
2⅞– 3½	2.8750	2.6894	.0040	.0120	.0080	.0030	.0085	.0055
3 – 3½	3.0000	2.8144	.0040	.0120	.0080	.0030	.0085	.0055

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in once inch of thread is permitted.

Taps with pitch coarser than S. A. E. Standard will take U. S. Standard tolerances. Those with pitch finer than S. A. E. Standard will take S. A. E. Standard tolerances.

TABLE 9

Commercial Tolerances for Nut and Tapper Taps S. A. E. Standard

Size	Basic		Tap Measurements					
			O. D.			P. D.		
	O. D,	P. D.	Min. = Basic Plus	Max. = Basic Plus	Tolerance	Min. = Basic Plus	Max. = Basic Plus	Tolerance
¼–28	.2500	.2268	.0020	.0050	.0030	.0010	.0030	.0020
5/16–24	.3125	.2854	.0020	.0050	.0030	.0010	.0030	.0020
⅜–24	.3750	.3479	.0020	.0050	.0030	.0010	.0030	.0020
7/16–20	.4375	.4050	.0020	.0060	.0040	.0010	.0035	.0025
½–20	.5000	.4675	.0020	.0060	0040	.0010	.0035	.0025
9/16–18	.5625	.5264	.0025	.0065	0040	.0015	.0040	.0025
⅝–18	.6250	.5889	.0025	0065	.0040	.0015	.0040	0025
11/16–16	.6875	.6469	.0025	.0070	.0045	0015	.0045	.0030
¾–16	.7500	.7094	.0025	0070	.0045	.0015	0045	.0030
⅞–14	.8750	.8286	.0025	0070	.0045	.0015	.0045	.0030
⅞–18	.8750	.8389	.0025	0070	.0045	.0015	.0045	.0030
1 –14	1.0000	.9536	.0025	0070	0045	.0015	.0045	.0030
1⅛–12	1.1250	1.0709	.0030	0080	0050	.0020	.0055	0035
1¼–12	1.2500	1.1959	.0030	0080	.0050	0020	0055	.0035
1⅜–12	1.3750	1.3209	0030	0080	.0050	0020	.0055	.0035
1½–12	1.5000	1 4459	0030	0080	0050	0020	0055	.0035

LEAD TOLERANCE

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Taps with pitch coarser than S. A. E. Standard will take U. S. Standard tolerances. Those with pitch finer than S. A. E. Standard will take S. A. E. Standard tolerances.

It is interesting to know how and for what purposes an association of this kind was formed: Possibly the main objects can best be given by quoting from a general statement of purposes contained in its constitution: "The purpose of the Institute shall be the improvement of the tap and die manufacturing business by striving toward the correction by all proper and legitimate means of unintelligences, faulty standardization

and abuses in the trade. To co-operate along the lines of metallurgical research in the securing of better steels for use in manufacturing taps and dies so that the result will be to raise the standard of quality to its highest point of efficiency, thereby making great savings to the consumer, and, further, to co-operate in the standardization of sizes, dimensions and tolerances of the product manufactured by the members of the Institute.

TABLE 10

Basic Thread Dimensions and Tap Drill Sizes

A. S. M. E. THREADS

Nominal Size	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill To Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
0-80	.0600	.0519	.0438	3/64	.0469
1-56	.0730	.0614	.0498	54	.0550
64	.0730	.0629	.0527	53	.0595
72	.0730	.0640	.0550	53	.0595
2-56	.0860	.0744	.0628	50	.0700
64	.0860	.0759	.0657	50	.0700
3-48	.0990	.0855	.0719	47	.0785
56	.0990	.0874	.0758	45	.0820
4-32	.1120	.0917	.0714	45	.0820
36	.1120	.0940	.0759	44	.0860
40	.1120	.0958	.0795	43	.0890
48	.1120	.0985	.0849	42	.0935
5-36	.1250	.1078	.0889	40	.0980
40	.1250	.1088	.0925	38	.1015
44	.1250	.1102	.0955	37	.1040
6-32	.1380	.1177	.0974	36	.1065
36	.1380	.1200	.1019	34	.1110
40	.1380	.1218	.1055	33	.1130
7-30	.1510	.1294	.1077	31	.1200
32	.1510	.1307	.1104	31	.1200
36	.1510	.1330	.1149	1/8	.1250
8-30	.1640	.1423	.1207	30	.1285
32	.1640	.1437	.1234	29	.1360
36	.1640	.1460	.1279	29	.1360
40	.1640	.1478	.1315	28	.1405
9-24	.1770	.1499	.1229	29	.1360
30	.1770	.1553	.1337	27	.1440
32	.1770	.1567	.1364	26	.1470

TABLE 10
(CONCLUDED)

Basic Thread Dimensions and Tap Drill Sizes

A. S. M. E. THREADS

Nominal Size	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
10-24	.1900	.1629	.1359	25	.1495
28	.1900	.1668	.1436	23	.1540
30	.1900	.1684	.1467	22	.1570
32	.1900	.1697	.1494	21	.1590
12-24	.2160	.1889	.1619	16	.1770
28	.2160	.1928	.1696	14	.1820
32	.2160	.1957	.1754	13	.1850
14-20	.2120	.2095	.1770	10	.1935
24	.2420	.2149	.1879	7	.2010
16-18	.2680	.2319	.1966	3	.2130
20	.2680	.2355	.2030	7/32	.2187
22	.2680	.2385	.2090	2	.2210
18-18	.2940	.2579	.2218	B	.2380
20	.2940	.2615	.2290	D	.2460
20-16	.3200	.2794	.2388	G	.2610
18	.3200	.2839	.2478	17/64	.2656
20	.3200	.2875	.2559	I	.2720
22-16	.3460	.3054	.2648	9/32	.2812
18	.3460	.3099	.2738	L	.2900
24-16	.3720	.3314	.2908	5/16	.3125
18	.3720	.3359	.2998	O	.3160
26-14	.3980	.3516	.3052	21/64	.3281
16	.3980	.3574	.3168	R	.3390
28-14	.4240	.3776	.3312	T	.3580
16	.4240	.3834	.3428	23/64	.3594
30-14	.4500	.4036	.3572	V	.3770
16	.4500	.4094	.3688	25/64	.3906

Additionally, it was designed that the Institute function as a central bureau or source of information with which other engineering and manufacturing organizations may consult, and obtain reliable information in co-operative efforts for the benefit of the industry as a whole.

The officers of the Institute are: President, F. G. Echols, Vice-President and General Manager, Green

Table 11
Basic Thread Dimensions and Tap Drill Sizes
UNITED STATES THREAD

Nominal Size	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill To Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
1–64	.0625	.0524	.0422	3/64	.0469
72	.0625	.0535	.0445	3/64	.0469
1–60	.0781	.0673	.0563	1/16	.0625
72	.0781	.0691	.0601	52	.0635
1–48	.0938	.0803	.0667	49	.0730
50	.0938	.0808	.0678	49	.0730
1–48	.1094	.0959	.0823	43	.0890
1/8–32	.1250	.1047	.0844	3/32	.0937
40	.1250	.1088	.0925	38	.1015
2–40	.1406	.1244	.1081	32	.1160
1–32	.1563	.1360	.1157	1/8	.1250
36	.1563	.1382	.1202	30	.1285
11–32	.1719	.1505	.1313	4/32	.1406
1–24	.1875	.1604	.1334	26	.1470
32	.1875	.1672	.1469	22	.1570
11–24	.2031	.1760	.1490	20	.1610
1–24	.2188	.1919	.1646	16	.1770
32	.2188	.1985	.1782	12	.1890
11–24	.2344	.2073	.1806	10	.1935
1/4–20	.2500	.2176	.1850	7	.2010
24	.2500	.2229	.1959	4	.2090
27	.2500	.2260	.2019	3	.2130
28	.2500	.2268	.2036	3	.2130
32	.2500	.2297	.2094	1/32	.2187
5–18	.3125	.2764	.2403	F	.2570
20	.3125	.2800	.2476	11/64	.2656
24	.3125	.2854	.2584	I	.2720
27	.3125	.2884	.2644	J	.2770
32	.3125	.2922	.2719	9/32	.2812

TABLE 11
(CONTINUED)
Basic Thread Dimensions and Tap Drill Sizes
UNITED STATES THREAD

Nominal Size	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill To Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
3/8–16	.3750	.3344	.2938	5/16	.3125
20	.3750	.3425	.3100	21/64	.3281
24	.3750	.3479	.3209	Q	.3320
27	.3750	.3509	.3269	R	.3390
7/16–14	.4375	.3911	.3447	U	.3680
20	.4375	.4050	.3726	25/64	.3906
24	.4375	.4104	.3834	X	.3970
27	.4375	.4134	.3894	Y	.4040
1/2–12	.5000	.4459	.3918	25/64	.4219
13	.5000	.4501	.4001	25/64	.4219
20	.5000	.4675	.4351	29/64	.4531
24	.5000	.4729	.4459	29/64	.4531
27	.5000	.4759	.4519	29/64	.4687
9–12	.5625	.5084	.4542	31/64	.4844
18	.5625	.5264	.4903	31/64	.5156
27	.5625	.5384	.5144	33/64	.5312
5/8–11	.6250	.5660	.5069	33/64	.5312
12	.6250	.5709	.5168	33/64	.5469
18	.6250	.5889	.5528	35/64	.5781
27	.6250	.6009	.5769	37/64	.5937
11–11	.6875	.6285	.5694	37/64	.5937
16	.6875	.6469	.6063	37/64	.6250
3/4–10	.7500	.6851	.6201	41/64	.6562
12	.7500	.6959	.6418	43/64	.6719
16	.7500	.7094	.6688	11/16	.6875
27	.7500	.7259	.7019	45/64	.7187
11–10	.8125	.7476	.6826	45/64	.7187
7/8– 9	.8750	.8029	.7307	49/64	.7656
12	.8750	.8209	.7668	49/64	.7969
14	.8750	.8286	.7822	13/16	.8125
18	.8750	.8389	.8028	53/64	.8281
27	.8750	.8509	.8269	27/32	.8437

TABLE 11
(CONCLUDED)

Basic Thread Dimensions and Tap Drill Sizes

UNITED STATES THREAD

Nominal Size	Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill To Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
15/16- 9	.9375	.8654	.7932	13/32	.8281
1- 8	1.0000	.9188	.8376	7/8	.8750
12	1.0000	.9459	.8918	59/64	.9219
14	1.0000	.9536	.9072	15/16	.9375
27	1.0000	.9759	.9519	31/32	.9687
1 1/8- 7	1.1250	1.0322	.9394	63/64	.9844
12	1.1250	1.0709	1.0168	1 3/64	1.0469
1 1/4- 7	1.2500	1.1572	1.0644	1 7/64	1.1094
12	1.2500	1.1959	1.1418	1 11/64	1.1719
1 3/8- 6	1.3750	1.2668	1.1585	1 7/32	1.2187
12	1.3750	1.3209	1.2668	1 19/64	1.2969
1 1/2- 6	1.5000	1.3918	1.2835	1 11/32	1.3437
12	1.5000	1.4459	1.3918	1 27/64	1.4219
1 5/8- 5 1/2	1.6250	1.5070	1.3888	1 29/64	1.4531
1 3/4- 5	1.7500	1.6201	1.4902	1 9/16	1.5625
1 7/8- 5	1.8750	1.7451	1.6152	1 11/16	1.6875
2 - 4 1/2	2.0000	1.8557	1.7113	1 49/64	1.7812
2 1/8- 4 1/2	2.1250	1.9807	1.8363	1 25/32	1.9062
2 1/4- 4 1/2	2.2500	2.1057	1.9613	2 1/32	2.0312
2 3/8- 4	2.3750	2.2126	2.0502	2 1/8	2.1250
2 1/2- 4	2.5000	2.3376	2.1752	2 1/4	2.2500
2 3/4- 4	2.7500	2.5876	2.4252	2 1/2	2.5000
3 - 3 1/2	3.0000	2.8145	2.6288	2 43/64	2.7187
3 1/4- 3 1/2	3.2500	3.0645	2.8788	2 31/32	2.9687
3 1/2- 3 1/4	3.5000	3.3002	3.1003	3 3/16	3.1875
3 3/4- 3	3.7500	3.5335	3.3170	3 7/16	3.4375
4 - 3	4.0000	3.7835	3.5670	3 11/16	3.6875

TABLE 12

Chamfer on Dies

All dies listed in our catalogue will be chamfered approximately as shown in the following table. When dies are specified with a chamfer varying from that shown in the table they will be considered special.

APPROXIMATE NUMBER OF THREADS CHAMFER

Type of Die	Front Face	Rear Face
Spring Screw Threading	2½ to 3	.....
Solid Square Bolt	2½ to 3	1 to 1½
Solid Square Pipe	2½ to 3	0
Adjustable Round Split, Straight Thread	2½ to 3	1 to 1½
Adjustable Round Split, Taper Thread	2½ to 3	0
Gas Fixture	2½ to 3	1 to 1½
Hexagon Rethreading	1	1

Tables 5, 6, 7, 8 and 9 give commercial tolerances for taps. It should be clearly and distinctly understood that the figures given by these tables represent the measurements of the taps themselves and *not* the tapped hole.

field Tap and Die Corporation, Greenfield, Mass.; Vice-President, J. E. Winter, General Manager, Winter Brothers Co., Wrentham, Mass.; Chairman Committee on Standards, C. M. Pond, Assistant Manager, Small Tools Department, Pratt & Whitney Co., Hartford, Conn.; Secretary, Herbert S. Blake. The office of the Tap and Die Institute, headquarters of the secretary, is located at 116-120 West 32nd Street, New York City.

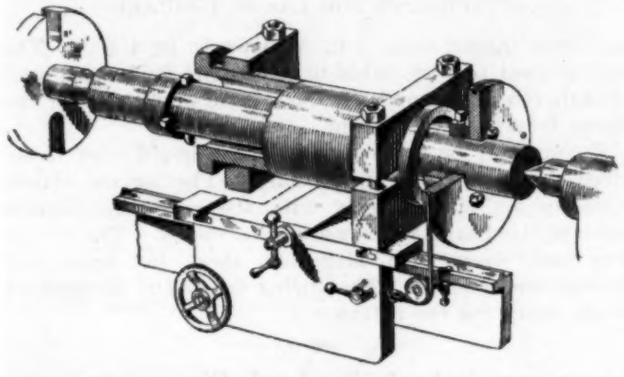
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

A Kink in a Mexican Mine Shop

By E. W. Heinrichs
Frenillo, Mexico

In out-of-the-way places, far removed from the regular sources of supply and yet where all sorts of emergency jobs of unusual and unforeseen nature are continually presenting themselves, it is necessary to have either a very complete and comprehensive equipment or to possess a fair amount of the ingenuity that



RIG FOR OIL GROOVING LARGE BEARING SLEEVES

enables the shop man to do all sorts of jobs by improvised methods—usually the latter.

The writer is foreman of the machine shop in a Mexican silver mine and it is his duty to see that repairs to mining machinery of all kinds are made promptly and the machines kept in service. Often there are jobs to be done that are beyond the scope of the equipment and the latter must be supplemented with homemade devices and contrivances for getting out the work. One such job that came along recently was the cutting of oil grooves in some large sleeves for turbine bearings.

These sleeves were of bronze, 8 in. in diameter inside and 9½ in. outside by 24 in. long, with a substantial head at one end, as the sketch will show. To cast and machine these sleeves up to the point of cutting the oil groove was ordinary work and need not be described to the machine shop man, but the cutting of the right and left hand helical grooves was quite another matter.

The work was all done in a McCabe lathe. The sleeves were mounted on blocks on the carriage and bored in the usual way with a bar between centers. To make the oil grooves we proceeded as follows:

We fitted a 16-in. diameter blind flange to the outer end of the boring bar and fastened it with setscrews. In the periphery of the flange we then cut a groove to accommodate a ¼-in. steel cable; so calculating the diameter at the bottom of the grooves as to make one-half its effective circumference equal to the length of a sleeve and thus determining the "lead" of our helix.

A small hole drilled at an angle from the groove through the side of the flange furnished a means of attaching the cable to the drum and the free end was then passed under a sheave, previously clamped to the front of the lathe bed, and carried forward to the carriage. With a suitable tool in the collar, or cutter head of the bar, we were ready to proceed with the work of cutting.

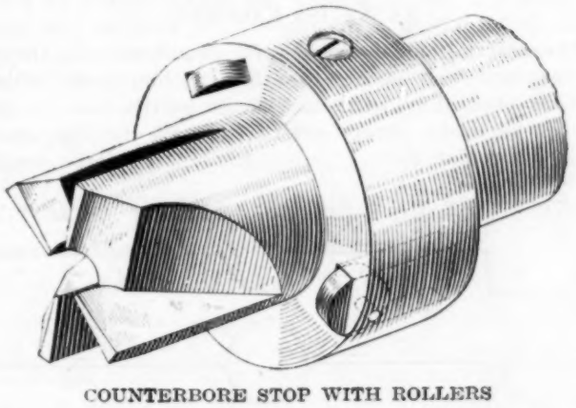
As the carriage is advanced it withdraws the cable from the drum and causes the latter to rotate one-half of a revolution in 24 in. of carriage movement. The tool was set out by hand after each successive cut. To cut the opposite helix all that was necessary was to transfer the sheave and cable to the back of the lathe, a procedure that caused the bar to rotate in the opposite direction.

The method did not require a great amount of rigging up and the job was quickly and satisfactorily done. The only objection raised was by the poor "Mex" whose duty it was to traverse the carriage by hand. He gets one peso per day of eight hours—equivalent to about 50 cents in American money—but we must not overlook the important fact that if he got more we would have to hire a new bunch of men every day.

Roller Stop for Counterbore

By C. E. Andrews

The sketch shows a roller stop that was designed for use in connection with some work having a highly finished surface that must not be marred and upon which the depth of the counterbored space must be held within very accurate limits. The ordinary form of counterbore stop would have left a blemish upon the



COUNTERBORE STOP WITH ROLLERS

surface, no matter how light the contact, and the nature of the work necessitated gaging the depth from this surface.

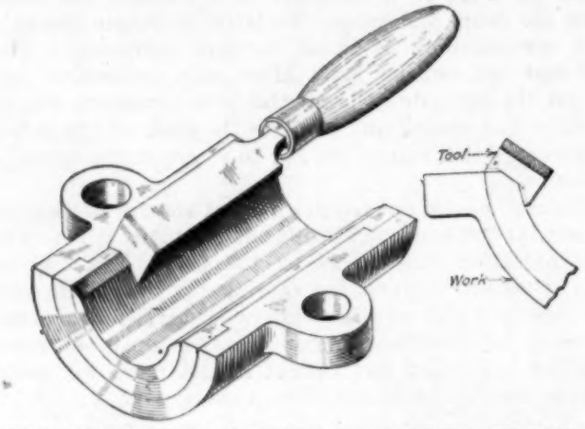
Though but one roller is shown in the sketch it is desirable to have three or more in order to balance the pressure upon the collar when the rollers contact with the gaging surface.

Chamfering the Edges of Bearing Caps

By George A. Luers

It is essential that the edges of bearing caps and bearings be beveled. A new bearing when first run will tend to flow and this space permits the metal to move out into the groove and so prevent the babbitt from burning out. Oil is distributed from the groove on the bearing surfaces, the groove serving as a reservoir.

A tool for the purpose of cutting a bevel on either the cap or the seat is illustrated in the sketch. This tool was devised to overcome some of the disadvantages encountered in making the bevel. To file the bevel is difficult because of the clogging of the file with the particles of babbitt. To chip the groove disturbs the metal in the seat, making it necessary to scrape it down afterwards. This bevel cutting tool has been found to do the work rapidly, cutting a clean smooth edge. The cutter may be sharpened with an oil stone on both faces, as cutting is done in both directions. The guiding surfaces are relieved by rounding the edges so that they will not cut on surfaces where cutting is not required.

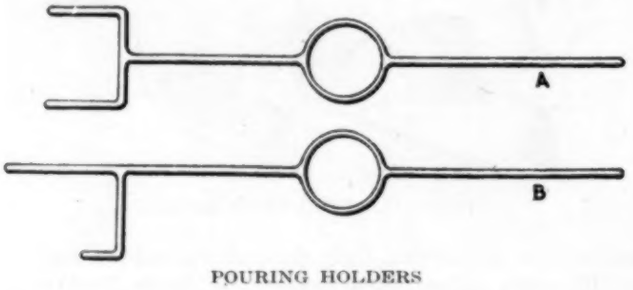


TOOL FOR BEVELING EDGES OF BABBITT BEARINGS

A Convenient Pouring Holder

By Walter Kaufman

The average pouring holder for crucibles is as shown in sketch *A* and is a rather hard holder from which to pour accurately, as it is difficult for the men to get up to the flasks except where they are set far apart or in a circular form. In our foundry we have stands which hold flasks in a long straight line, making it very awkward to pour with the usual holder. By simply making the center rod of holder straight and making the right handle the only one used in pouring, as in sketch *B*, we make it possible for the men pouring to get up very close to the flasks and pour accurately.



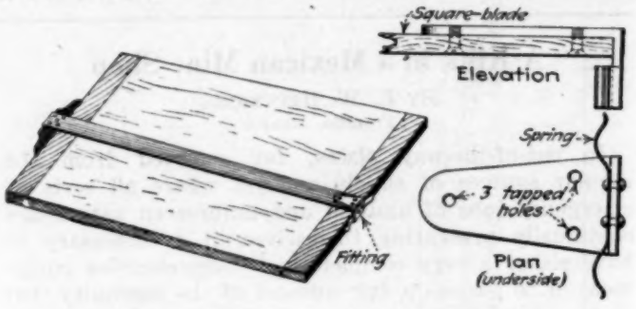
POURING HOLDERS

A Drafting-Room Kink

By E. Lytton Brooks

The accompanying sketch shows a simple and useful little contrivance for assisting in the manipulation of large and unwieldly T-squares.

Three countersunk screws, sunk in the square blade from the underside serve to secure the fitting, which has three tapped holes $\frac{1}{4}$ in. Whitworth or 4 B.A. The spring used is $\frac{1}{2}$ in. wide by 0.020 in. thick with just enough tension to prevent the square sliding down the board from its own weight.



ATTACHMENT FOR LARGE T-SQUARE

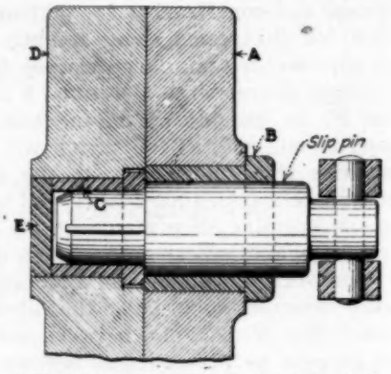
Rollers may be fitted to engage the board edge if desired, but are quite unnecessary. The square should slide up and down freely with the head kept square against the board when working properly. The fitting was made from $\frac{1}{4}$ in. aluminum sheet, but brass will answer well enough. The spring tension is determined when mounting the fitting.

An Index Lock-Pin

By C. H. Van Fossen

The illustration shows a simple method of constructing a slip-pin device for locking an indexing jig in its several positions. The same scheme may, of course, be adapted to milling fixtures and to sliding members instead of rotating ones as described, and for that reason is adaptable to many varieties of work.

A hole is first drilled and reamed in the base plate *A* to receive the hardened and ground bushing *B*, the bore of which is ground to a close fit for a standard reamer. This bushing is pressed in place and then serves as a jig through which the hole for the bushing *C* may be drilled and reamed through plate *D*. It is only necessary then to line up the two members in the required positions and ream the holes in line. A counterbore to receive the head of the bushing *C* may be added afterward.



METHOD OF FITTING A LOCK PIN

The two diameters of the slip-pin are then ground to slip fits in the respective bushings. To protect the device from dirt and chips a soft plug *E* may be added, and, in that case, the small diameter of the slip-pin should be scored to permit the escape of air when the pin enters the bushing.

Two Simple Rigs for Grinding Cutters

By I. B. Rich

For grinding the tops of the teeth of slitting saws and cutters of a similar nature the device shown in Fig. 1 has proved very satisfactory. The base *A* carries an upright with a stud *B*, considerably smaller than the hole in the cutter. The base also has a slot cut at *C* which acts as a stop for the tooth at the bottom of the cutter. In use the operator merely slips the cutter over the stud *B*, locates a tooth against the stop at *C* and pushes the cutter toward the grinding wheel *D* until it stops against the stud *B*. Assuming the teeth to be evenly spaced this gives a uniform tooth length and the grinding can be done very rapidly.

A device for use in grinding the face of the teeth of similar cutters is shown in Fig. 2. Here the stud *B* is mounted vertically in the base *A*, a top view being

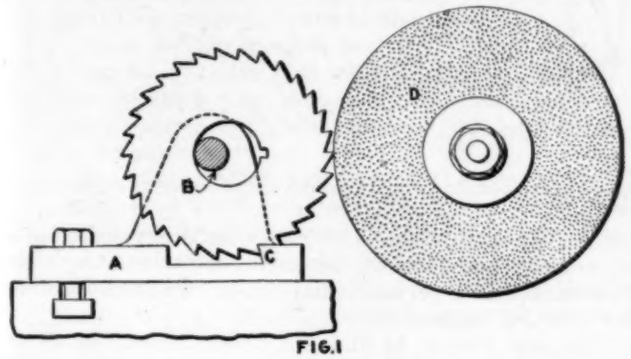


FIG. 1

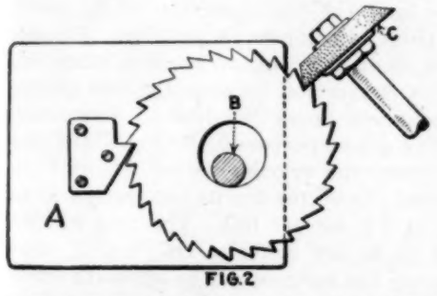


FIG. 2

FIG. 1—FIXTURE FOR GRINDING CUTTER TEETH. FIG. 2—MODIFICATION FOR GRINDING FACE TEETH

shown. In order to have the cutter clear the wheel when being indexed the fixture is set on about the angle shown. The cutter is moved up against the side of the wheel *C* until it stops against the stud *B*. This device is used by the Pioneer Instrument Co., Brooklyn, N. Y.

Automobile Cylinder Lap

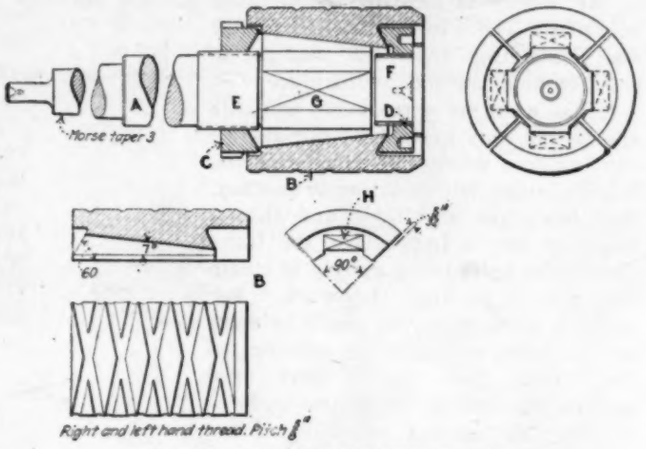
By R. E. D. Delrue

Steyr, Austria

The accompanying illustration shows a typical design of an automobile-cylinder lap which has been used very successfully for lapping cylinders to size.

It is our practice not to grind our cylinders but to lap them to size after a series of careful boring operations. For some time we used the well-known split lap which is expanded by means of a tapered key or a wedge. Such a lap, however, has the disadvantage of expanding unevenly, the lower part increasing in size much more than the upper. This condition caused our laps to follow any unevenness in the cylinder-bore, leaving it in an imperfect condition and to avoid this trouble I constructed the lap illustrated which has the advantage of expanding evenly along its whole length, so that it needs in no case, to be turned after each resetting.

The lap consists of an arbor *A*, provided at one end with a shank to fit the lapping-machine spindle. At the



LAP FOR AUTOMOBILE CYLINDERS

other end four wedge-shaped splines are milled to receive the lapping segments *B*, which are held in position by means of the nuts *C* and *D*, engaging threads at *E* and *F*. The lapping segments are turned to shape out of a solid bar of copper after which they are sawed apart. A channel *H* is milled through their full length and is made to accurately fit the splines on arbor *A*.

After the lap is assembled, it is turned to the correct diameter and a right and left hand thread about $\frac{1}{32}$ in. in depth cut over its surface, the thread serving to facilitate the introduction of the lubricant mixed with the lapping ingredients. To expand the lap, the nut *C* is loosened a trifle while the nut *D* is tightened. By the motion of nut *D* the lapping plates are moved towards the larger parts of the splines and expanded. The movement of the lapping plates being parallel to the axis of the arbor *A* it is possible at any time to adjust them for wear.

We have lately put in operation a somewhat different type of lap in which the lapping plates are made of steel and covered with copper to a thickness of about $\frac{1}{32}$ in., the advantage being that after the plates have been fully expanded to take up wear, the copper plates can be removed and new ones put on. The lap is then restored to its original diameter.

Utilizing Fixtures on Different Machines—Discussion

By Stanley W. Mills

The articles under the above title by Frank C. Hudson and C. L. Henry on pages 27 and 582, Vol. 57 of the *American Machinist*, remind me that in 1908 I established a system for fixture tongues practically the same as that used by the Lucas Machine Tool Co.

The reason for an off-set tongue with respect to the slot in base of fixture is not plain to me and in fact appears to be a distinct detriment rather than an advantage, for the reason that it is entirely possible for the fixture to be mis-located with respect to the slot in the platen.

From the point of view of accurately grinding the keys or tongues which should preferably be case-hard-

ened, it appears to me to be just as simple to locate the tongue centrally with the base as in the manner shown by Mr. Hudson, although there may be some advantage in his design as applied to an overhanging fixture. I venture to disagree with the plan adopted by Mr. Henry of locating the tongues against one side only of the T-slot in the machine platen and depending upon the clamps or bolts to hold the fixture in place.

It has been my experience, and this applies not only to fixtures but also in any instance where one piece must be held definitely with relation to another, that bolts are unreliable and that a dowel or key is imperative, the function of the bolts being merely to clamp and not to position the work. Mr. Henry's plan, however, would be more or less satisfactory, if in addition to the clamps, jack screws were used against the side of the fixture to force the tongues against one side of the slot and it is possible that this device is used by him.

I believe it is recognized that in holding a casting on the faceplate of a lathe or table of a boring mill, positioning screws should always be used in conjunction with clamps, thus reproducing the effect a conventional fixture which should always be designed to rigidly hold the work from movement without dependence on clamps or bolts.

I recall that the objectionable features of different width slots in various makes of milling machines were overcome in one very well equipped shop by machining the slots in all platens to the same width. Such a plan is, of course, more or less costly and involves very careful work. Once done, however, the difficulties with keys of miscellaneous widths will be eliminated.

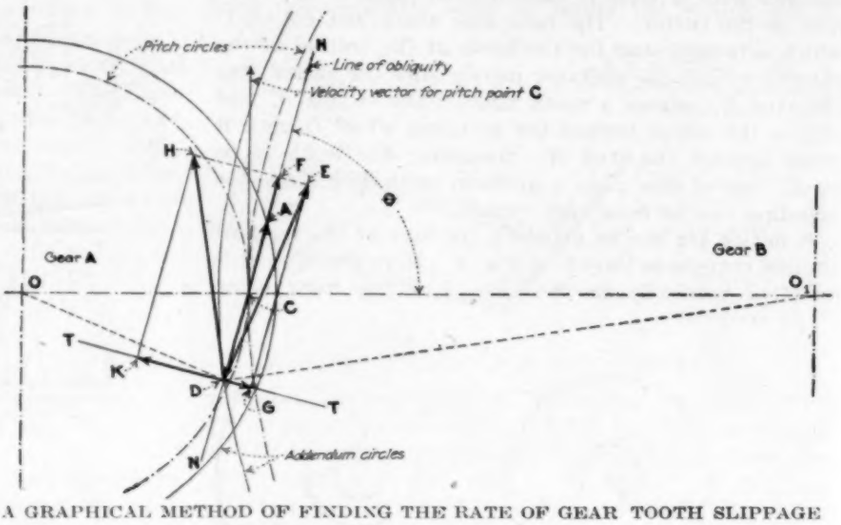
Finding the Rate of Gear Tooth Slippage

By Wm. H. Jefferis

Some time ago a large manufacturing plant experienced trouble with a pair of involute gears, designed to transmit from 50 to 75 hp. at 13,000 r.p.m. One of the faults discovered after running the gears a short time was a very pronounced burnishing effect on the face of the teeth. After being analyzed, it was finally decided that this defect was due to slippage. To obtain the rate of slippage, therefore, the following graphical method was devised.

The greatest amount of slippage occurs at the point of contact which is farthest from the pitch point, and this point may be readily found by the following construction: First, as shown in the accompanying illustration, the line *NN* is drawn through the pitch point *C* making the angle θ (equal to 90 deg.—the pressure angle) with the line of centers OO_1. This line is called the line of obliquity and on it lie all points of contact. The path of contact, therefore, must be somewhere on this line. Its limits are found at its intersection with the addendum circles and give *DA* for the path of contact.

Due to the difference in the diameters of the two gears, the path of contact in approach *DC* is greater than the path of contact in recess *CA*. For this reason, we will use the point of contact *D* and we will now find its linear velocity on the gear *B*. Taking the distance O_1D (which is the addendum radius) and multiplying it by 2π x r.p.m. of gear *B*, we get the linear velocity of *D* in inches per minute. Representing this velocity by a vector in its true direction which is perpendicular



A GRAPHICAL METHOD OF FINDING THE RATE OF GEAR TOOTH SLIPPAGE

to DO_1, we have *DH*. Now resolving this velocity into its components along the common normal and the common tangent *TT* perpendicular to *NN*, we have the lines *DF* and *DK* respectively.

The next step is to find the linear velocity of *D* on gear *A*. First, we have the true direction of its linear velocity which is perpendicular to radius *OD*. We also have its component along the common normal, since this normal is the line of connection between the two sliding surfaces and components along the line of connection must be equal. A line drawn perpendicular to *DF* at *F* and cutting *DE* at *E*, gives the velocity vector *DE* of *D* on gear *A*, and resolving the vector for its component along the common tangent *TT* we get *GD*. The rate of sliding will be found to be *GK* equal to *DG* + *DK* since the components along the tangent act in opposite directions. Measuring this distance with the same scale used for vector *DH*, we get the slippage in inches per minute at this point of contact. The slippage at any other point can be found in a similar manner.

This method also easily proves the fallacy of the common belief among practical men that due to the method of constructing the involute gear tooth, pure rolling contact is taking place at all points of contact. In order to have pure rolling contact there must be no slippage or no components of velocities along the common tangent. This condition will be seen to exist only at the pitch point where the velocity vectors for both gear *A* and gear *B* will coincide and be of equal length.

Novel Scale Holder—Discussion

By Elam Whitney

The holder for use with flat scales suggested by P. A. Daschke on page 702 would hardly be justified it seems to me. Triangular draftsman's scales can be purchased for less than the two machinist's scales. The draftsman's scale has the advantage of a beveled edge. Flexible steel scales are graduated on one side only, which would be a drawback to their use, on account of the number that would be required.

Locating Racks in a Milling Machine Vise

By R. A. Follensby

We had several hundred racks to be cut, 14 pitch, 64 teeth, and we were cutting them three at a time in a heavy manufacturing milling machine by means of a gang of three cutters that cut the whole number of teeth at one pass. One cutter of this gang cut 18 teeth in the racks and the others 20 and 26 teeth respectively. The cutter cutting 18 teeth became so badly broken that we could not continue and we decided to cut the remaining racks in two operations instead of incurring the expense of a new cutter.

The special vise in which the work was held is shown in end section in Fig. 1. The bolster *A* was held to the vise body by means of large fillister head screws and the fixed jam *B* was similarly attached to the bolster. There were two moving members *C*, which were nicely fitted to slots in the body of the vise and held against lifting or tilting under pressure by the bolster.

Each moving member had bolted to it, by means of collar-head screws from the outside, the movable jaws, one of which may be seen at *D*. Independent screws, not shown in the sketch, applied the holding pressure to the work.

After the cutter had broken the remainder of the racks were cut by the other two, making 46 teeth in each. We then devised the gage shown in Fig. 2 to reset them for cutting the rest of the teeth.

Two pieces of steel *E* and *F* were fitted together in the form of a try-square, with tongue and groove at the

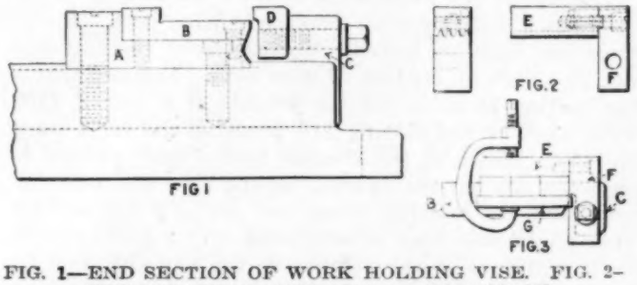


FIG. 1—END SECTION OF WORK HOLDING VISE. FIG. 2—THE LOCATING GAGE. FIG. 3—METHOD OF ATTACHING GAGE

joint and dowel pins for convenience in putting them together. A fillister head screw let into the piece *F* held them together.

After the gage was fitted up and checked for squareness, it was taken apart and rack teeth, corresponding to those in the work, were milled lengthwise of the under face of part *E*. It was then reassembled and fastened in position against the end of the movable jaw *D* of the vise.

With three of the racks in position in the vise and located lengthwise by the teeth of the new gage, the machine was set to cut the remaining teeth in the work by allowing two or three teeth of the cutter to overlap those already cut in the racks and adjusting the table of the machine until the two groups of teeth were accurately engaged.

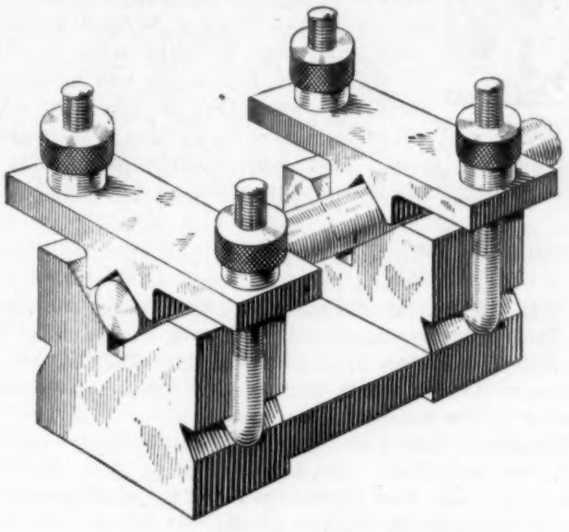
The method of locating the gage on the vise is indicated in Fig. 3, where a partial end view of the latter is shown with three racks in position and the gage held in engagement with them by means of the light clamp while the locating hole was laid off and drilled. The piece *G* was used merely to secure a firm bearing for the clamp across the bottoms of the racks.

Improved V-Block for Drilling

By E. Lytton Brooks

The V-block shown was designed for drilling through holes, as the ordinary straight block lends itself so readily to being drilled into and mutilated at the bottom of the V when the drill goes through with a rush.

The cut away blocks offer no difficult machining problems, and are well worth the making, as they are easier



TOOL MAKER'S V-BLOCK

to handle than an ordinary pair. Two grooves are machined along the bottom to facilitate clamping, and the style of clamp was chosen because it does not foul the drill chuck like the long center screw pattern. Both the block and clamp plate were made from tool steel, hardened and ground to finish. A slight clearance was ground out on the underface to allow the blocks to bear on the ends.

Fitting Hammer Handles

By H. K. Griggs

Much has been written about hammer handles and several devices have been shown to secure the handles in hammers.

A good hammer should have a double taper eye and the handle should fit on the under side of the eye. This is important. After driving the handle as far as possible into the hammer, saw the handle off flush with the outside. The piece sawed off usually provides material to make one or two hard wood wedges. With a thin pointed chisel make a diagonal split in the outer end of the handle. Dip the wedge in glue, drive it in and saw off flush.

Uusually if the handle is fitted properly one wedge is enough, but more can be used if required. Handles thus mounted seldom get loose unless alternately exposed in wet and very dry places. If any looseness is detected another wooden wedge can easily be driven in and if dipped in glue will not get loose. The chief cause of loose handles is that they were not properly fitted in the first place. This being so, no device will keep them tight. The fitting of hammer handles might well be under the control of the safety department in shops large enough to have one, for loose handles are a constant source of danger.

Editorial

WE ADMIRE THE MAN who has the ingenuity and go-get-there spirit to tie his jackknife to a beveled piece of wood and plane a board with it when his wife gives him a job and he has no plane, but we refuse to hire him when we have a real job of carpentry to be done. We want a man *and* his tools. Then why tolerate makeshifts in a shop where real jobs are in order all the time?

Another Abuse of Service

THE PROBLEM of what passes for service, but which is frequently unalloyed nerve on the part of the purchaser, bobs up again and again. Just as an instance of the demands a buyer will make, we cite a case of rather recent date.

The production end of a large plant finally decided that new equipment was needed. They were not sure which tool was best so they wanted to be educated, at the expense of the maker of the machines. So they proposed to several machine tool builders that they send a machine and an operator for three months' trial on their work, the successful machine to get a nice order for quite an equipment. As usual, the builders fell for it, some only part way to be sure, but others all the way, as the entire expense was supposed to be borne by the makers of the machines.

When you analyze this proposition it stands out as a bold bid for educating a production department at the expense of several builders of machines. They do the experimenting as to the best machine and the best tools for this work. They give their experience, the time of their men, the product of their machines and three months' wear, for the education of the production department of the concern which may buy several machines when their education is complete. It is cheap education for the buyer, but expensive for the machine tool industry as a whole. Furthermore, it is absolutely unfair to the buyer who knows what he wants, who does his own experimenting and who has production men who know the best methods of doing work.

If the buyer were willing to pay for his education, as he should, there would be no harm in such a proposition. But the machine tool builder must cover the cost of this so called service in the price of the machine, and the man who does not require it has to pay just as much as the man who must be educated.

The fair method would be to have a flat price without service, and a reasonable charge for all service rendered. It will, of course, be difficult for the builders to enforce such a rule unless all determine to stop the present practice. This can hardly be done until the service abuse is allowed to grow to unbearable proportions. The remedy may have to come from the other side, by the buyers who do not need service or education absolutely refusing to pay the same price as the man who does. Neither remedy is easy of accomplishment, but there is a growing feeling that a change is inevitable and not far distant.

Small Tools Are Small in Size Only

NO MACHINE is better than the tool used in it. If we accept this truism we may expect every manufacturer to be everlastingly on the qui vive for the best tools and constantly trying to make them still better. There are such manufacturers, we are happy to concede, but there are more who are everlastingly trying to reduce the cost of small tools and shutting one eye to the results. The other eye is cocked at the happy reduction in expenses brought about through charging small tools to this class of disbursements.

Costs of small tools are expenses. Expenses should be held down to a minimum—a mighty good rule, by the way—and so everything possible is done either to reduce the expenditures for small tools or else to make them disappear in some mysterious way in the maze of shop rules and bookkeeping.

If Mr. Manager had kept both eyes open he would have seen something more than a reduction in expenses. In fact, he would have seen that there was no reduction at all, but rather the opposite. It takes two eyes to get perspective.

The second eye would have seen a reduction in output or to put it differently an increase in labor cost. Maybe there has been no increase because labor costs always were too high on account of poor tools. Suppose that a tool costing $5 turns out the product at a cost of $100 while another tool costing $10 produces the same work for $50. Which is the cheaper tool is easy enough to see when one has the figures, but the man who does the work with the so-called cheap tool probably has no idea what might have been accomplished with a good one and so he continues saving pennies on the tool and wasting dollars on the work.

Then, too, if the poor tool is made in the plant the chances are 10 to 1 that it does not cost less than a good one—it only seems to cost less. The amount of juggling one can do with labor, material and especially overhead, intentionally or not, is something surprising. A home-made tool believed to cost $5 might easily cause a loss of $10 per piece if made in quantities and sold for $20.

If a home-made tool were good and cheap it would be more than welcome; if it were good but expensive it would be acceptable; if it were cheap but not very productive, it might be tolerated if there were only one of its kind, but if it slows down production all over the shop, it becomes a nuisance. And that is exactly what poor tools do, whether they are made at home or outside. A home-made drill of inferior quality slows down not only the machine on which it is used but every machine in its neighborhood.

But is there reason to think that a home-made tool is of poorer quality than the standard commercial article? In answer we can only ask questions. Would you expect to build an electric motor as good as one you can buy, and would you shave yourself with a home-made razor before trying it out on somebody else? Have you the equipment, the material, the facilities and espe-

cially the knowledge of the man whose sole business it is to make tools?

And then there are the makeshifts. It is bad enough when you make a tool just like any other of its kind, only not quite so good, but when you make makeshifts you act in very much the same way as if you were regularly going through the movements used in resuscitating a half-drowned man every time you breathe.

Worst of all is it to keep a defective tool rather than buy a new one, to reduce the output of a $4,000 milling machine to one-third of its capacity because you hate to throw away a crooked arbor.

Don't forget that in the running of a machine shop small tools are small in size only.

The Machinery Market in South America

WITH FACTS and figures which are striking, the November issue of *Commerce Monthly*, the trade organ of the National Bank of Commerce of New York, calls attention to the favorable position of the United States with respect to future trade with South America. It stresses the valuable relationships which have been established and points out the great improvement which has been made in shipping facilities since 1914.

In the period from 1910 to 1913 it is shown that but 15 per cent of the southern continent's total imports came from the United States. By 1917, due to the great impetus given foreign trade generally as a result of the war, South America reached a point where 46 per cent of her needs were supplied by America. That the post war depression has had but little effect on the trade established, is shown in the imports for 1920 which show the United States still greatly in the lead and supplying 42 per cent of the total.

The South American export trade with the United States is no less striking. Before the war she sold us 20 per cent of her outgoing products. In 1917 we took 42 per cent and in 1920, 33 per cent of her goods. That we should hold the abnormal war position is hardly to be expected. Recent statistics, however, point clearly to the fact that future trade with South America will be permanently larger than ever before.

There is a lesson in these general statements for *American Machinist* readers. South America today is closer to us than she has been at any previous time in history. On the one hand, American travel thither and study on the ground has brought about an appreciation, not only of the vastness of the continent, but of its tremendous possibilities. On the other hand, clear thinking and far seeing people in those southern republics have derived an inspiration from the example set them by their northern neighbor. History is repeating itself. To those republics, as has been the case in America, expansion has come to mean nationalization and nationalization has brought about strength and elevation of view. Not only are they advancing their frontiers, but the ground already conquered is rapidly being made, in each republic, the scene of an intensive agricultural and industrial development.

The tool manufacturer will do well to give thought to this market. The various republics in 1910 bought $305,069 worth of American metal working machinery. In 1917 their purchases from us for this class of goods more than doubled, reaching $795,449. By 1920, in the face of a worldwide depression and depreciated exchange, the figures reached $1,764,419, more than five times those of 1910.

The future in South America for the machine tool industry of America is one of great promise. An era of industrial and economic development, of railway and power expansion, understood and appreciated by but few, is not merely conceived but actually under way.

The Personal Element in Precision Grinding

PRECISION grinding is an operation in which the individual skill of the operator counts for much. There are so many factors entering into the production of perfect work that personal skill is always likely to be at a premium in work of this kind.

We recently dropped into a little shop with a large reputation for good work and found it busy, as usual, not on ordinary, low priced contracts but on a lot of shafts for an automobile transmission which had to be *right*. These shafts were from the shop of one of the best known quality cars in the country. They were not sent out to this small shop to save money but to secure a better pob than the factory could obtain with the best grinding equipment money could buy. The factory had the machinery and it had good men, but they were not good enough to get the very best results, which they desired.

Two men, experts in grinding, run this little shop and are reaping the rewards of long years of careful study and experience in grinding. They have good grinding machine equipment of course, the same as the automobile shop has, but they have more; they have the personal skill and knowledge which enable them to get just the right results. They know the right wheels to use, the proper fit of bearings, the importance of proper dressing of the wheel and many other points that have a bearing on the product.

There is a growing demand for better grinding and with it is coming the opportunity for men who really know modern grinding machines and grinding practice. We can think of no more promising field for young mechanics who are ambitious to excel in their chosen field.

Just Suppose

JUST SUPPOSE somebody came to you and told you that you might get much better results in the shop by making certain changes which had been tried out by A.B.C. and X.Y.Z. and found to work well; wouldn't you naturally tell him that you know your own business best and that, anyhow, your conditions are different and that such schemes may be all right in some shops but not in yours? No, sir! not in yours.

And now suppose your friend comes to you and says that he gets much better mileage out of his Vix tires than out of the Nix brand you use, recommending at the same time a carbureter he has tried out with glorious results and a spark plug which will spark when the battery is nearly dead. Wouldn't you just naturally tell him that you know best how to run your own car and that, besides, those things may be all right on his car but that they would never work on yours?

Of course not. Nobody is as big a fool as that, but when it comes to running a shop—that's different. So it is, but—

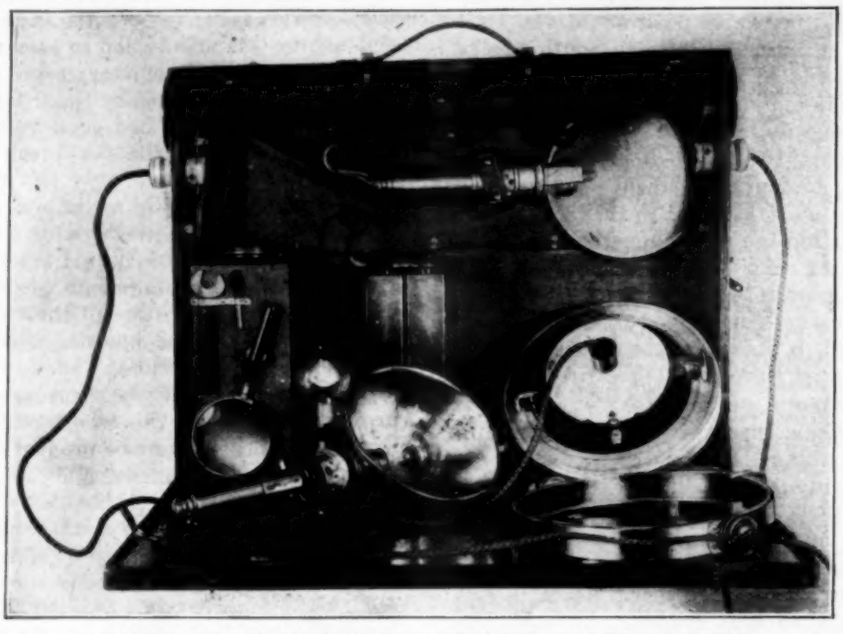
Just suppose.

Shop Equipment News

Elverson Oscilloscope

The Elverson oscilloscope is an optical-mechanical device for visually slowing the motion of rapidly moving mechanisms so that an observer can easily study just what is taking place. The apparatus, which is shown herewith in portable form, is built by Herbert Kennedy & Co., Ltd., London, England, whose representative, Peter Davey, is at present in this country and located at the office of John H. Faunce, 8 Bridge St., New York, N. Y.

The mechanism consists primarily of a commutator, shown on the right side, which flashes a lamp or lamps, so as to synchronize with the motion of the object to be examined. These lamps are specially designed and constructed so as to give an instantaneous flash, such as cannot be obtained with a filament. They are filled with neon gas, through which a discharge takes place from one electrode to the other. They have the peculiarity of improving with age. The commutator referred to is in reality a special form of gear box driven direct from the mechanism to be studied. In this gear box are contact breakers operated by means of cams, which control the flashing of light. Current for the lamp comes from a small 4-volt storage battery, through special coils and condensers, making the instrument independent of outside connections. On the gear box is a switch plate by which the operator can make the object appear stationary or moving at one per cent of its normal speed. A part moving at 1,000 r.p.m. seems to move but 10 r.p.m., so that its motion can be easily studied. There are also two sides which give two or four flashes per revolution, for use in studying vibrations or gyrations in rapidly moving parts.



ELVERSON OSCILLOSCOPE MOUNTED IN A PORTABLE CASE

This gear box will control flashes up to 28,000 per minute, which means that almost every kind of high-speed machinery can be studied in action as though it were at rest. By moving the outer dial, which is graduated in degrees, the position of the object being studied can be varied, the graduations showing exactly the relation of the two observations. By this means the exact period of the opening and closing of a valve, or a similar period in any mechanical movement, can be accurately determined and the action visually studied.

For studying the periods of vibration the slides shown are of particular value. One slide controls the stationary and the other the creeping position. Pulling the slide out to the first notch doubles the number of flashes, and the second notch gives four flashes per revolution. As the gear box is driven positively from or in relation to the shaft being studied, increasing the number of flashes clearly shows whether or not the period is at shaft speed.

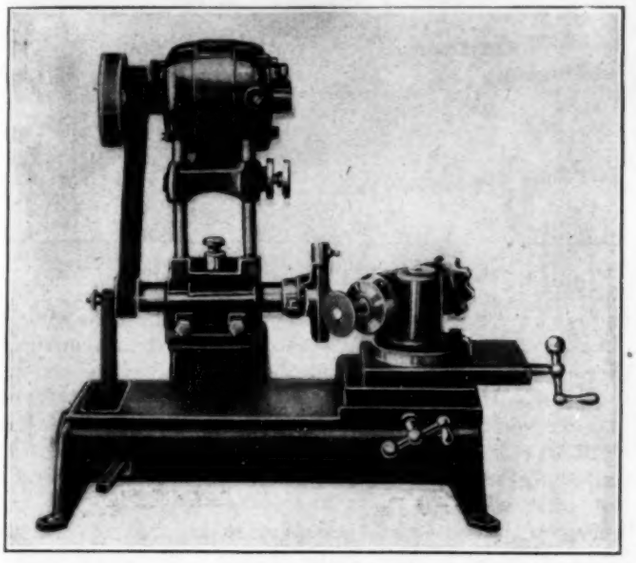
When the critical period is reached, two distinct images appear. If these appear with the double flash, the period occurs at the speed at which the shaft is running. If the double image appears when the flashes are four times the shaft speed, then the vibration period is at double the engine speed. Experience with the device will show many points of vital interest to designers of all kinds of machinery, especially that which runs at high speed. With the knowledge thus obtained showing exactly what happens under running conditions, defects can be detected and better machinery designed. The use of this device shows so much that could formerly only be guessed at, that its applications are very wide. Among some of its uses have been the detection of gas-engine valves which did not seat until after bouncing three or four times, of oil systems which were not functioning properly, of knot-tying machines which were not getting the correct motions, of the actual working of magneto breaker points and of the distortion of airplane propellers.

With the oscilloscope, designers and builders of automatic machinery of all kinds, can study the exact movement of any part under actual working conditions, which takes into account the deflection of parts, the rebound after a sudden contact, and many other points of vital interest. It is not necessary to have a dark room in which to operate the machine being tested, although direct light should be cut off. The intensity of the light from the oscilloscope is sufficient to give the illumination necessary. The observer needs no auxiliary apparatus through which to view the mechanism under test, as its action is evident to the naked eye.

Sapihl Portable Electric Valve and Toolpost Grinding Machine

An electric-driven portable grinding machine having a wide range of uses has recently been placed on the market by the General Tool & Equipment Co., 70 Monroe St., Chicago, Ill. The tool, which is designated as the Sapihl portable electric grinding machine, is adapted to general use.

The chief feature of the device is that all running parts are equipped with ball bearings, both in the motor and in the wheel and work spindles. The accompanying illustration shows the device arranged for grinding the poppet valves of automotive engines, with a valve held in place in the chuck. The chuck can be indexed to give any angle desired to the valve, and it is mounted on a compound slide so that it can be both traversed across the wheel and fed in toward it.



SAPIHL PORTABLE ELECTRIC GRINDING MACHINE

The work-carrying spindle is rotated by means of connections from the grinding spindle, although it can be disengaged while the motor is running. The reamers for machining the valves in the motor block can also be sharpened in the machine, thus insuring that the same angle is obtained on both the valve and the seat.

The motor and spindle unit can be detached from the base and employed separately on machine tools for light grinding operations. It can be readily mounted on the toolpost of a lathe for performing both internal and external grinding. The motor is driven from a convenient lighting circuit, so that it may be attached wherever a lighting socket is available. It is controlled by means of a snap switch on the cord. It is adjustably mounted on the two upright bars, and can be raised by means of a knurled screw for tightening the belt, and then clamped.

The spindle is mounted in double-row S. K. F. self-aligning bearings. The height of the spindle can be varied by means of an adjusting screw. Both internal and external work can be done, extension spindles being furnished for the latter. A heavy extension spindle can also be furnished for large internal grinding.

The machine can be employed as an ordinary abrasive wheel for the general uses required around the shop, such as sharpening tools and grinding contact points.

"Marvel" No. 2 Portable Motor-Driven Draw-Cut Hacksawing Machine

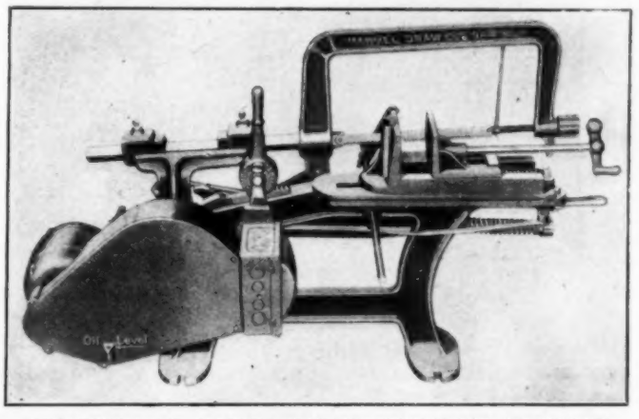
The Armstrong-Blum Manufacturing Co., 333 N. Francisco Ave., Chicago, Ill., has recently placed on the market a portable motor-driven style of its "Marvel" No. 2 draw-cut hacksawing machine. The machine, which is similar in general characteristics to that described on page 215, Vol. 40 of *American Machinist*, has a capacity for work 6 x 6 in. in section on long stroke, and 8 x 8 in. on short stroke. Blades from 12 to 17 in. in length can be used.

The motor is attached to the rear of the machine, so that the chips from the saw do not get into it, and it is connected by means of a silent chain to the driving crankshaft. The gears, sprockets and chain are entirely inclosed in a cast-iron housing, and run in oil. The motor is of ½ hp. and can be furnished for the style of electric current that is available, for either power or lighting circuits.

When the machine is furnished with a motor that can be operated from a lighting circuit, a plug receptable is attached to the top of the switch box, so that the motor can be easily connected to any available lamp socket by means of an extension cord. In this way, the machine can be moved to the place where the work is to be done, and connected to a convenient lighting circuit.

The portable feature is of particular value when work is being done on structural or ornamental iron, on sheet metal, or on parts that cannot be easily transported in a garage or machine shop. The whole machine can be mounted on a small platform truck, so that it may be moved to any part of the plant where a job must be done. This truck mounting is particularly useful for maintenance and millwright departments.

An inclosed externally operated fused switch is attached to the front of the gear housing, and all wiring between the switch and the motor is inclosed in conduit.



"MARVEL" NO. 2 PORTABLE HACKSAWING MACHINE

The starting handle on the front of the machine is connected to the switch so that the method of operation is just the same as that of a belt-driven machine. The motor and the machine are started by moving the handle to the left, and they are stopped by moving it to the right. Thus, no clutch is required. When a cut is completed, the saw frame trips the starting handle and automatically opens the switch and stops the motor.

The vise holding the work is only 19½ in. from the floor. The length overall of the complete machine is 52 in., while the extreme width is 18 in. The machine weighs 350 lb. net, and 450 lb. when crated for shipping.

Towmotor Model C Gasoline Industrial Tractor

An industrial tractor driven by a gasoline engine and capable of general use about a machine plant has reecntly been placed on the market by the Towmotor Co., 1226 East 152nd St., Cleveland, Ohio. The accompanying illustration shows the Model C machine, which has a normal drawbar pull of 1,150 pounds.

One of the principal features of the machine is the small turning radius, as the minimum outside turning radius is only 5 ft. 3 in. The machine is driven by the two rear wheels and steered by the two front ones. Cast-steel disk wheels fitted with Timken bearings are provided. The tires are solid rubber; the front ones are 16 x 3½ in., and the rear 22 x 3½ in. double.

A four-cylinder, four-cycle motor stated to deliver 23 brake horsepower at 2,000 r.p.m. is employed. A battery is mounted under the truck for ignition and for operating the starting motor. A thermo-syphon cooling system is provided. The 6-gal. gasoline tank feeds by gravity and is located in front of the driver. The clutch has a single plate, and the transmission one speed forward and one reverse.

Fabric universal joints are placed between the transmission and the rear axle, which is of the internal-

TOWMOTOR MODEL C GASOLINE INDUSTRIAL TRACTOR

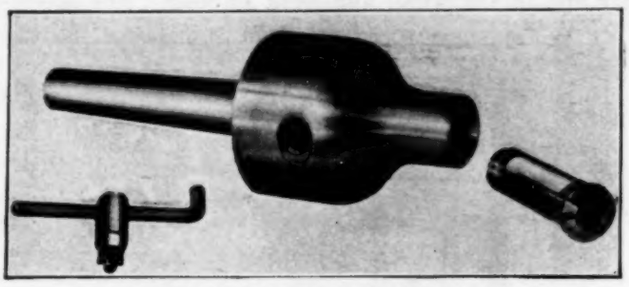
gear-driven type. It is full-floating, runs on Timken bearings and gives a speed reduction of 8 to 1. The frame has a depth of 9½ in. and rests on semi-elliptic springs at both the front and rear. Brakes of the internal-expanding type are located on the rear wheels. The machine has a speed from 1 to 8 miles per hour.

Bumpers made of ⅜-in. steel plate are provided at both front and rear for the full width of the chassis. These bumpers give protection to the vital parts of the machine and serve for pushing operations. Couplings on both the front and rear are adjustable for height. The wheel base of the machine is 40 in. Its overall length is 72 in., and the width 40 in. It weighs about 2,900 pounds.

Rockford Milling Machine Co. Spring Collet Chuck

A chuck for holding spring collets has recently been placed on the market by the Rockford Milling Machine Co., Rockford, Ill. The device is intended for gripping small rods, straight shank drills, milling cutters and parts that are to be rotated in a spindle.

As the accompanying illustration shows, the chuck consists of a body to which is attached a shank at its rear end and which has a tapered hole at the front



ROCKFORD SPRING COLLET CHUCK

end. The collet fits the tapered hole in the nose of the chuck and is drawn back in place by a wormwheel threaded on the inside to fit the threads on the end of the collet. It can be quickly moved in and out by turning the worm with the key wrench. Turning to the right draws the collet against the taper and closes it uniformly from all sides. Turning to the left forces the collet out.

The small nose on the collet makes it possible to bring work very close to the chuck. The shank of the drill or milling cutter is gripped throughout almost its entire length, so that rigidity is increased and the tendency to crystallize and break the cutter is reduced. There are no projecting parts to catch the hands of the operator.

The device is made of hardened and ground alloy steel. The shank can be furnished to fit any spindle of standard taper. The chuck is adapted particularly to lathe as well as to milling machine use, as when gripping stock no draw-in attachment is necessary. The chuck is ordinarily made in three sizes having B. & S. tapers of 9, 10 and 11, respectively. Collets up to 1 in. in diameter can be held.

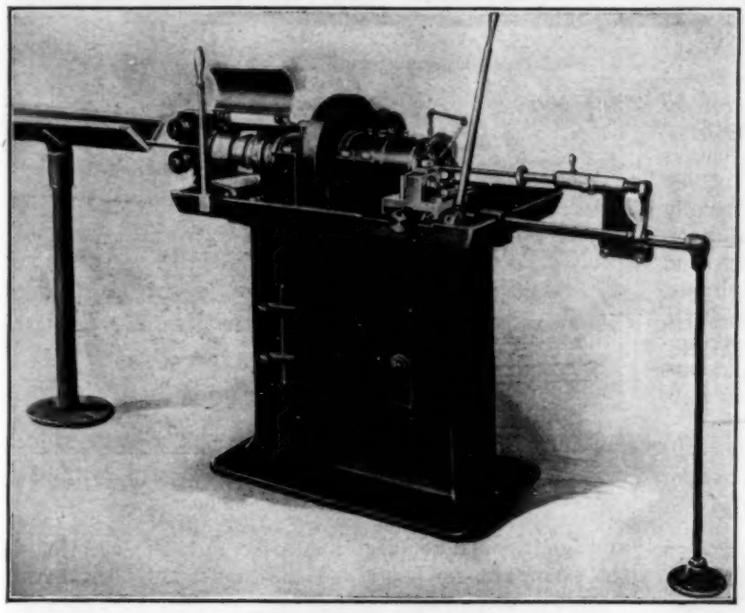
Changes in "Modern" Cutting-Off Machine

The cutting-off machine made by the Modern Machine Tool Co., 601 Water St., Jackson, Mich., for cutting pipe, tubing and solid bars, both round and hexagon, has recently been altered in design so that it appears as shown in the accompanying illustration. The specifications and general dimensions of the machine are the same as formerly, as it is made in sizes having maximum capacities of 1, 2 and 3 in. outside diameter.

The principal changes lie in the method of handling the stock and the positions of the control levers. Although the No. 1 machine is equipped with the roll feed, such as formerly used, the two larger sizes are now provided with a double live roller feed for feeding the stock through the spindle. An automatic stop is provided on all sizes of the machine for gaging the length of the piece being cut.

The stop for the stock is operated from the tool

block. The arrangement is such that as the toolblock is moved out to clear the tool after the cut, the last part of its travel moves the stock stop about $\frac{1}{16}$ in., and brings it up to position for properly locating the work. As soon as the toolblock is fed in to start the cut, a spring causes the stop to move back clear of the work



"MODERN" CUTTING-OFF MACHINE

again. In this way the stop does not wear due to the rotation of the work, and the work itself can drop away from the tool after it is cut off. A stop pin is arranged so that the operator can tell when the tool is clear of the work.

The double live roller feed for feeding the stock through the spindle is driven through a worm and gears from the cone pulley shaft. As the machine is slowed up to accommodate large stock, the feed is also slowed. The feed rolls run continuously. They are so trunnioned and connected with the lever operating the collet that the movement opening the collet brings the rolls simultaneously up to the stock. A further slight pressure on the lever feeds the stock through the spindle against the stop. The back movement of the collet lever throws the rolls clear of the stock and closes the collect.

The lever controlling the collet is placed in a vertical position, and the mechanism altered so that movement is much easier than in the former model. In running the machine, it is not necessary for the operator to remove his hands from the two levers. A pull of the left hand on the collet control lever opens the collet and feeds the stock through the spindle up to the stop. A push closes the collet; and on stock up to 3 in. in length of small diameter there is no perceptible wait for the feeding of the stock.

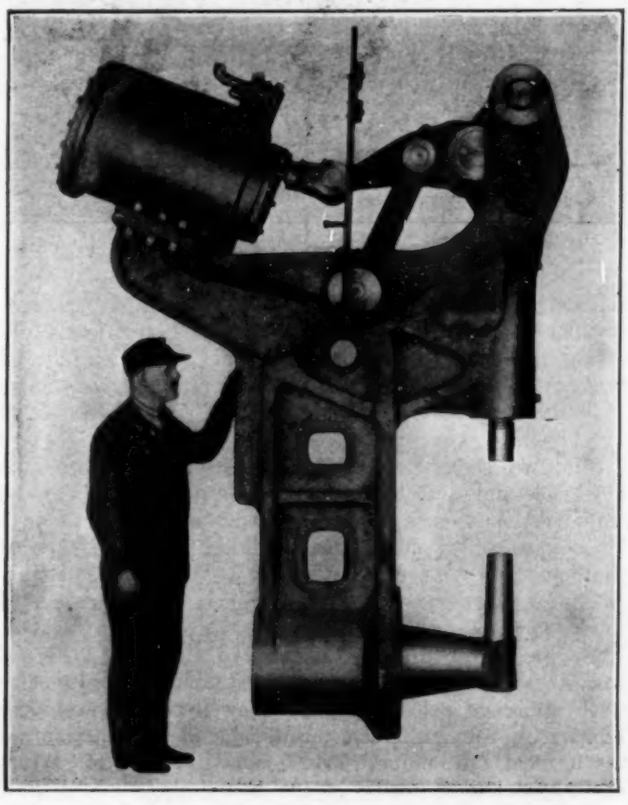
A movement of the right hand on the tool feed lever then causes the tool to feed into the work. When the cut is finished, the reverse movement of this lever pulls the tool from the work and brings the automatic stop into place ready for positioning the next piece. Since a very large number of pieces are cut off per hour, the economy of effort and time on the part of the operator is of considerable importance and enables an increase in the rate of production of the parts.

Hanna Last-Head Boiler Riveting Machine

The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has just completed and shipped the large riveting machine shown in the accompanying illustration, for use when riveting through the manhole the last head in a boiler. The reach of the unit is from 14 to 18 in., and the gap 35 in. The capacity is 1,000 tons. The machine may be arranged with either a straight-push hydraulic actuating mechanism, or with the Hanna pneumatic mechanism. The diameter of the cylinder is 18 in., and the stroke of the die $5\frac{3}{4}$ inches.

The machine is arranged for portable use in two positions, and suspension is made with the dies vertical. It swivels about a point close to the center of gravity, so that the stationary die can be swung on and off the manufactured head of the rivet in a direction very nearly parallel to the line of travel of the die. The mass or weight of the riveter is thus not lifted nor lowered during riveting.

The distance from the center of the beam stake, which is of forged alloy steel, to the end face of the die standing thereon is 30 in., allowing a 60-in. shell to be accommodated. The length of this die can be varied in conjunction with the opposite die to take care of shells as small as 42 in. in diameter. The distance from the axis of the dies to the long face of the throat is 16 in. The machine is used on high-pressure containers, in which the rivets are $1\frac{1}{4}$ in. in diameter and the plates $1\frac{1}{2}$ in. thick, requiring a heavy machine. It has a weight of 9,900 pounds.



HANNA LAST-HEAD BOILER RIVETING MACHINE

Midwest Box Rails and Steel Stringers

In order to give speed and ease of installation when erecting mechanical equipment, particularly overhead members such as lineshafts, a system of anchorage material in the form of rolled steel sections designated as box rails and steel stringers, is now being manufactured by the Midwest Steel & Supply Co., Inc., with general offices at 28 West 44th St., New York, N. Y.

The box rails are a sort of continuous socket insert; a good idea of them can be obtained by referring to Fig. 1. They are considerably heavier than the ordinary socket inserts, and have a cross-sectional area that is considerably greater, so as to give strength. They can be furnished in any length required, and are usually built into the ceilings or walls of concrete buildings during erection. A surface slot is left exposed, and through the use of a special bolt which can be slipped into the slot at any point and given a quarter turn, anchorage support can be provided for machinery, motors, transmission lines, sprinkler systems and apparatus that need be supported from the ceiling or wall.

The rail can also be employed for supporting trolley beams for monorail conveyor systems, in the side walls of buildings for carrying crane rails, and in the floor for mounting large presses and machinery. Sections of box

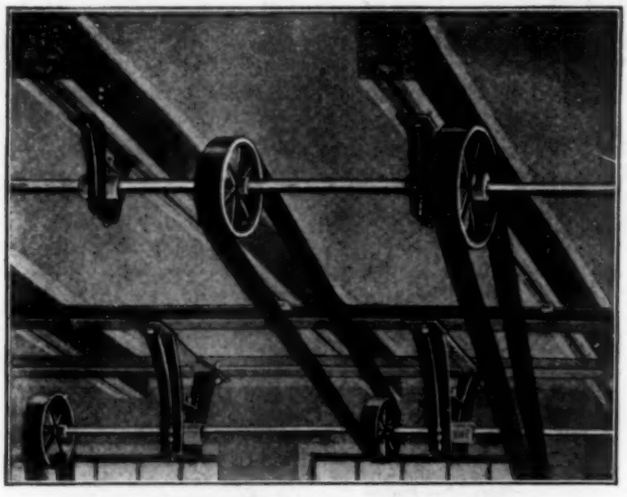


FIG. 1—MIDWEST BOX RAILS IN POSITION

rail can be inserted vertically into side walls of storerooms and stock rooms, and brackets for carrying shelves or bar stock can be clamped to them The advantage of this method of installation is that practically any type of bracket can be used, and the space between them can be readily varied.

Since the box rail is usually installed with its outside face flush with the concrete or brick, it can be employed as a base for electric motors. It thus provides a range of adjustment sufficient to take care of the belt slack without cutting out a piece of the belting.

The steel stringers are also rolled steel sections of various sizes, and can be furnished in even foot lengths. They are more directly related to the intallation of machinery and transmission lines, and in conjunction with standard bolts and clips they form a system for supporting lineshafts and countershafts, as well as other mechanical equipment. Fig. 1 shows a pair of stringers supported by bolts in the box rails, while Fig. 2 shows the stringers attached to overhead I-beams and carrying smaller cross stringers. The stringers are adapted to any type of building contruction, as they are attachable to either wooden or steel girders.

One of the principal features of the system is its flexibility, as adjustment in either direction is provided, and units can be added, taken away or re-positioned to take care of additional equipment, changes in location

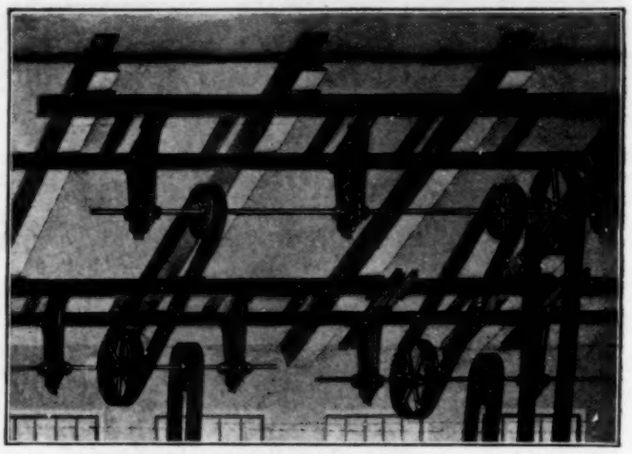


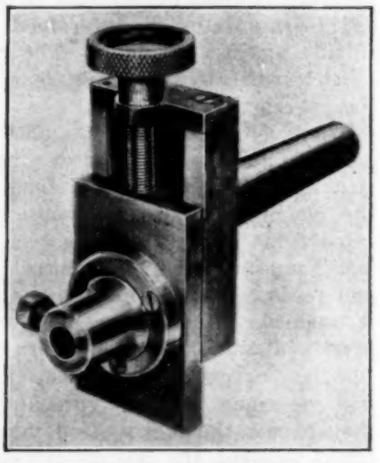
FIG. 2—MIDWEST STEEL STRINGERS CARRYING LINE SHAFTING

and such contingencies that arise. In the erection of the stringers, no holes need be made, nor tools except wrenches employed.

Industrial plants can carry assorted lengths of steel stringers in stock to provide for emergencies such as breakdowns or the erection of temporary countershafts. In this way, the steel stringers can be employed instead of wooden ones. Of course, they are not affected by shrinkage or warping under varying temperature conditions, as are the wooden stringers.

Bruce Precision Eccentric Boring Head

The Precision & Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa., has recently added to its line the Bruce precision eccentric boring head that is illustrated herewith. The tool is intended especially for application to drilling and milling machines when boring jigs and fixtures, and also when index boring. The two members sliding on each other are provided with a gib to take up wear. One member carries a shank to fit the spindle of the machine, and the other an adaptor to hold the cutting tool. The eccentricity of the tool can be varied by means of the micrometer screw.

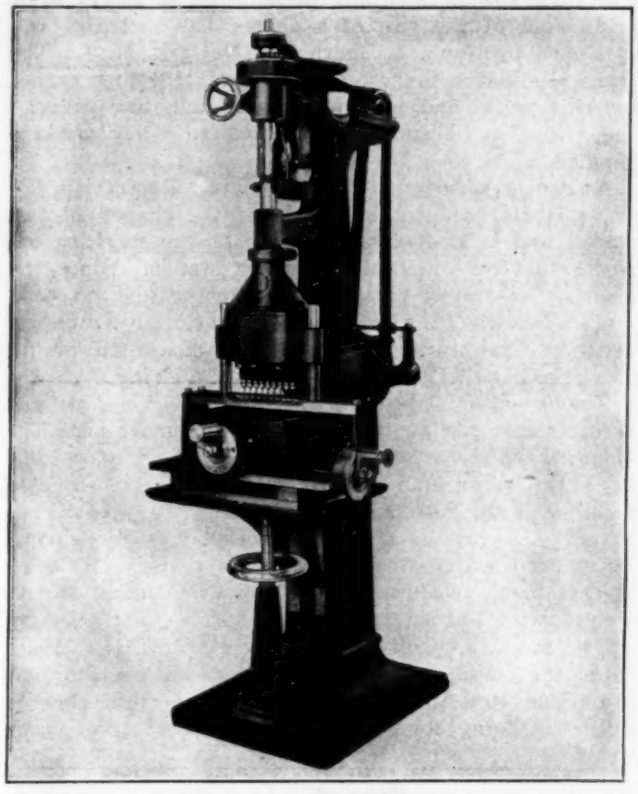


BRUCE PRECISION BORING HEAD

The head is made in four sizes, the capacities being, respectively, $\frac{3}{8}$ to $1\frac{1}{4}$ in., $\frac{1}{2}$ to $2\frac{1}{2}$ in., $\frac{3}{4}$ to 4 in. and 1 to 6 in. The adaptors furnished with each size permit of holding different sizes of drills, so that the tool can be used for both drilling and boring.

Hoefer Special Ball-Bearing Multiple-Spindle Drilling Machine

The machine shown herewith has recently been developed by the Hoefer Manufacturing Co., Freeport, Ill., to provide both speed and accuracy on light drilling work of a certain class. The work shown on the machine is a die plate employed in the manufacture of



HOEFER SPECIAL MULTIPLE DRILLING MACHINE

accounting machines for punching the cards, although with modifications the machine can be employed for other work of a similar nature.

The machine itself is the regular high-speed, ball-bearing drilling machine made by the concern. It is equipped with an automatic cam feed and return motion, so that practically the only work required of the operator is indexing the jig and replacing the drilled parts. The head itself is heavy enough to maintain alignment of all the parts. It has nine drilling spindles, all driven from the main spindle of the machine. It is counterbalanced by a weight in the column, but springs are also added between the head and the die plate to assist in raising it after the cut has been made. The springs can be seen on the two hardened guide rods that keep the head and the jig in correct alignment relative to each other.

The work is located by means of dowel pins on the upper table of the indexing jig, which is provided with an oil basin for cutting compound. The pins aid in properly replacing the work, should it be necessary to remove it. The work-holding table is placed on the compound table of the machine, so that it can be moved both longitudinally and transversely. The pitch of each screw is such that one turn moves the table the exact distance between the holes in the work. Across the top of the jig there is a heavy steel plate in which are located the liner and the slip bushings which guide the drills. The guide rods for the head are also secured to this plate. The arrangement is such that the plate does not interfere with the movement of the work and the compound table.

The die plate being drilled in the illustration given is from $\frac{1}{4}$ to $\frac{3}{8}$ in. in thickness, and has 12 rows of 45 holes each. Since the holes are too close to drill adjacent ones, every fifth hole in a row is drilled at the same time, so that a row can be completed in five operations. The center distance between adjacent holes are not permitted to vary more than 0.0005 in. It is stated that the 540 holes in a plate can be drilled in 22 min., although from 3 to 4 hr. are required to drill them by means of a single-spindle machine.

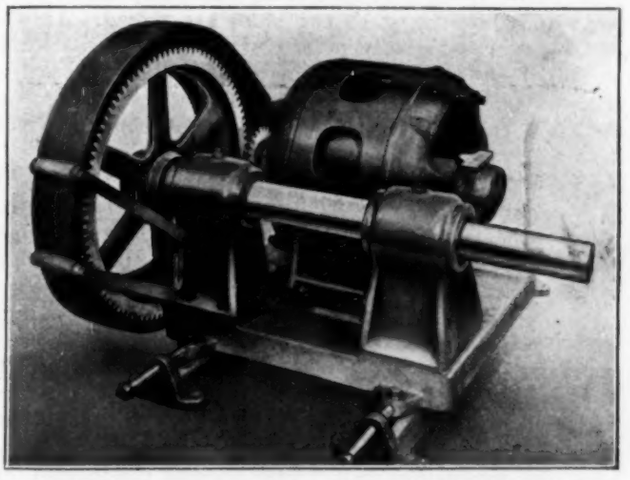
Motor Base with Speed-Reducing Gears

A cast-iron base for electric motors, having as an integral part a secondary shaft and speed-reducing gears, has been placed upon the market by the Bridgeport Motor Co., Inc., Bridgeport, Conn. It is intended for use in places where space is limited and where it is desired to drive a lineshaft directly from the motor without resorting to the extreme diameters of pulleys that would otherwise be necessary to obtain a large speed reduction with a plain belt drive.

The secondary shaft is mounted in two pedestal bearings having bronze sleeves and the ring oilers usual to motor construction. The driven gear is of cast iron and the motor pinion of rawhide, composition, fabroil or any other of the materials used for noiseless gear drives. Permanent gear guards form a part of the unit.

The smaller member of the secondary drive is keyed to the shaft opposite the main gear, and may be a plain pulley or a sprocket according to whether the drive is to be by belt or silent chain. The unit may stand upon or be suspended from cast-iron screw-adjusted guideways for floor or ceiling mounting, thus providing adjustment of center distances to maintain belt tension.

The unit is complete as shown in the illustration

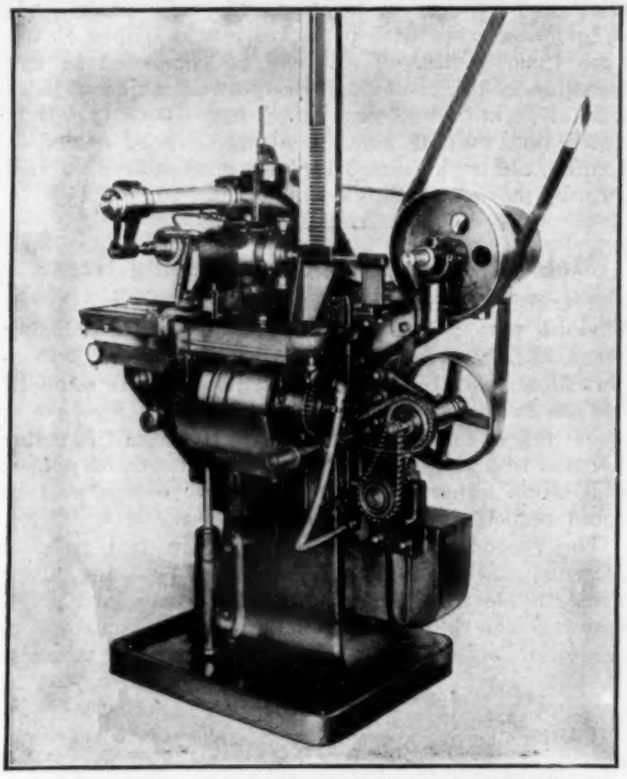


MOTOR BASE WITH SPEED-REDUCTION GEARING

with gear, pinion and guards, but without the motor. It can be furnished to specifications to suit any standard make of motor from $\frac{1}{2}$ to 50 hp., and with gear ratios of 3, 4, 5, 6 or 7 to 1. Larger or smaller units or other gear ratios will be furnished upon order.

"Standard" Automatic Milling Machine

The Standard Engineering Works, Pawtucket, R. I., has recently added to its line of milling machines a machine for automatically milling the squares on taps and other small work where a square is required. The



"STANDARD" AUTOMATIC MILLING MACHINE

machine, which is herewith illustrated, is fully automatic, having magazine feed and a mechanically opened and closed collet.

Two cutters are used on the arbor to straddle mill the work. After the first pass the work is withdrawn from between the cutters and automatically indexed 90 deg.; and then the other two sides are milled. An adjustable work stop is provided which insures the same length of cut on all pieces of a lot. The work when released from the collet falls on an inclined screen on the table, from which it rolls into a chute which carries it to a box on the floor.

The drive is from a countershaft to the rear shaft of the machine by a 2½-in. belt. Power is transmitted to a jackshaft directly below the rear shaft, then through a silent chain to the worm and wormgear to the drum cam, which has a pathway cut to move the table.

The spindle is mounted in phosphor-bronze bearings with means provided to take up any wear which may occur. It is driven by a 3-in. belt from the rear shaft. A crank is provided by which the machine may be turned over by hand when setting up. One man can operate three machines, as all that is required is to keep the magazines full. The normal production on ⅜-in. stock is stated to be 500 pieces per hour per machine.

Oil is supplied to the cutters by a chain-driven geared pump running at a constant speed. The tank is located at the rear of the machine and the oil drains from the table through flexible hose back to the tank. The tank has two compartments divided by a fine mesh screen, so that only clear oil is drawn into the pump. One collet, a countershaft and wrenches are furnished as regular equipment. With the equipment, the weight of the machine is 1,200 lb. The floor space occupied is 27 x 38 inches.

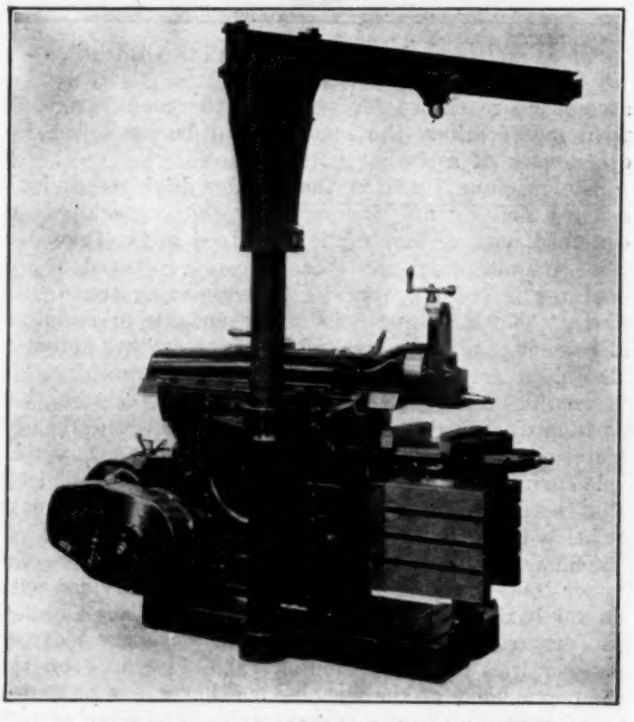
Gould & Eberhardt Jib Crane for Shapers

A jib crane to facilitate the handling of heavy work in and out of the vise of a shaper has recently been developed by Gould & Eberhardt, Newark, N. J. The crane eliminates the use of overhead traveling cranes for this work, and is intended especially for railroad shops, steel mills and industries where heavy work is handled.

As can be seen by the accompanying illustration, the crane is attached to the frame of the shaper in two places, and is located on the side of the machine opposite that on which the operator stands. Since the machine is driven directly by a motor and no belts are in the way, the crane can be revolved completely around. The crane will handle the maximum weight of work that the machine is capable of doing.

The mast is made of heavy wrought-steel pipe and securely clamped to the frame of the machine. The boom is an I-beam of sufficient strength to carry 1,000 lb. at its outer end. A trolley for carrying a chain block or motor hoist runs on the boom. A cap attached to the mast carries a ball and socket type of bearing, on which the cast-steel upper pintle rests. The boom is thus properly aligned at all times, so that it can be swung with but slight side pressure.

The machine itself has all levers within easy reach from the operating position, so that the operator can start and stop the machine and still remain close to the work being done. It has single-pulley drive and a



GOULD & EBERHARDT JIB CRANE ON SHAPER

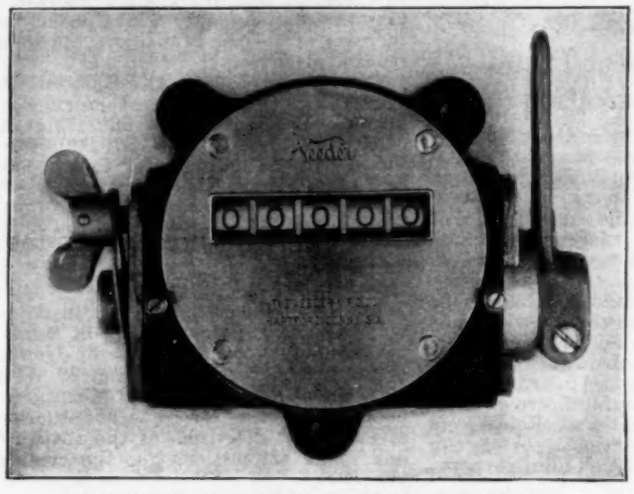
selective-type gear box, with heat-treated steel gears running in oil. Eight changes of speed, ranging from 9 to 115 strokes per minute, are available.

Veeder Heavy-Case Reset Ratchet Counter

The Veeder Manufacturing Co., Hartford, Conn., has recently brought out the stroke counter herewith illustrated, under the name of the Veeder heavy-case reset ratchet counter. The device is especially applicable to heavy presses and other machinery where it is subjected to severe strains from rough usage, vibration or careless handling. The case is extra heavy and the counting mechanism of unusually rugged construction.

The figure wheels are of large size, enabling the dial to be read with ease from a distance of 10 ft. or more. A substantial stop limits the movement of the operating lever to the amount necessary to register on the dial. The lever is adjustable upon the stem and may be set in any desired angular position. A sealing screw of special construction fastens the dial to the case and prevents unauthorized tampering with the reading.

One complete turn (or less, according to the position



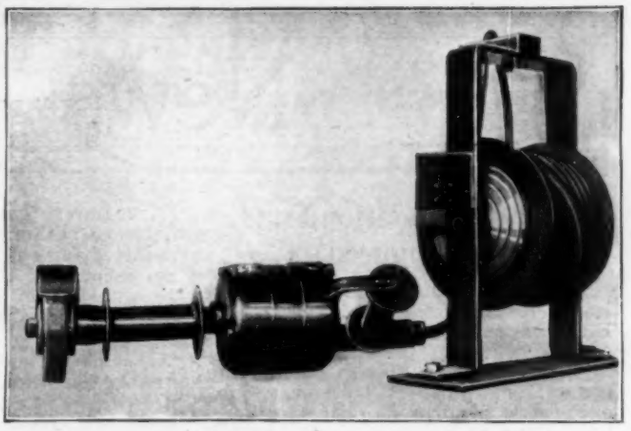
VEEDER HEAVY-CASE RESET COUNTER

of the figures) of the wing nut on the side of the case opposite the operating lever immediately returns the reading to zero. The counter is ordinarily provided with a five-figure dial and reset as shown in the illustration, but it can be furnished if desired with a six-figure dial by omitting the resetting feature.

Forbes & Myers Reel for Portable Electric Grinder Cord

The accompanying illustration shows a reel that has recently been developed by Forbes & Myers, 172 Union St., Worcester, Mass., for holding the flexible cord that is attached to a portable electric grinder or drill. These tools are ordinarily connected to a light socket by means of a flexible cord which is allowed to drag over the floor as the operator moves from one position to another, so that the cord frequently receives injury from being walked on or catching on sharp projections. Preventing the cable from dragging on the floor greatly increases its life.

In the reel there is a spring strong enough to wind up the cable and keep it off the floor, but not strong enough to annoy the operator as he uses the tool. The reel is adapted to use with different types of portable electric-driven tools, but is regularly furnished as shown herewith with the Model 35 portable electric grinder, together with 35 ft. of flexible cable. With the



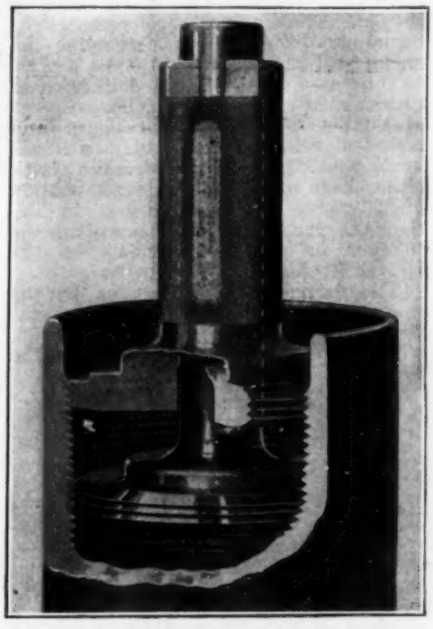
FORBES & MYERS REEL FOR PORTABLE GRINDER CORD

reel placed centrally in a room, either on the ceiling or on a column, the length of cable is sufficient to reach with the tool practically all positions in a room 60 ft. square.

Four wires are incorporated in the cable. Three of them are for the three-phase current which is ordinarily obtained from the lighting circuit. The fourth wire is a ground wire connected to the frame of the grinder and also to the frame of the reel. When the frame of the reel is connected to a water pipe or other permanent ground, danger to the operator from electric shock is minimized.

Pratt & Whitney Double Plug Pipe-Thread Gage

The accompanying illustration shows a gage recently placed on the market by the Pratt & Whitney Co., 111 Broadway, New York, N. Y., for measuring the taper of inside pipe threads. In use, the inner plug is first screwed down into the thread by hand, and is then followed by the outer plug, both parts being set tightly by hand. The witness line on the inner gage should come opposite the zero line on the graduated upper end of the handle. Variation from the true taper can be read directly on the scale. As marked on the handle, each division represents a variation of 0.002 in. in the pitch diameter in a length of 2 in., this length being the distance covered by the gage. The method of marking enables very rapid reading of the error in the taper.



P. & W. DOUBLE PLUG PIPE-THREAD GAGE

News Section

Coffin Foundation Fund Announced

For encouraging and rewarding service in the electrical field, the General Electric Company has set aside a fund of $400,000, to be known as the "Charles A. Coffin Foundation," the income from which will be distributed each year in prizes to its employees, recognition to lighting, power and railway companies for the improvement of service to the public as well as fellowships to graduate students and funds for research work at technical schools and colleges.

The foundation will be controlled and administered by a committee appointed by the board, which will distribute the $20,000 income as follows:

First—Eleven thousand dollars in prizes for the most signal contributions by employees of the General Electric Company toward the increase of its efficiency or progress in the electrical art.

Second—A gold medal, to be known as the "Charles A. Coffin Medal," will be awarded annually to the public utility operating company within the United States which during the year has made the greatest contribution toward the use of electric light and power for the convenience of the public. The company receiving the medal will also receive $1,000.

Third—A similar medal to the electric railway company within the United States which during the year has made the greatest contribution toward increasing the advantages of electric transportation for the convenience of the public. The company receiving the medal will also receive $1,000.

Fourth—Five thousand dollars is to be awarded annually for fellowships to graduates of American colleges and technical schools who, could, with advantage continue their research work either here or abroad, or some portion of all of the fund may be used to further the research work at any of the colleges or technical schools in the United States.

The foundation was created by the company as an expression of appreciation for the work of Charles A. Coffin, who, up to May 16 last, was head of the General Electric Company.

Car Shortage Shows Decrease

A decrease of 16,262 cars in the shortage of freight cars on November 15, compared with that on November 8 was shown in reports received today by the Car Service Division of the American Railway Association from the rail carriers of the country. The demand for cars in excess of the current supply on November 15 amounted to 158,236 cars, compared with 174,498 one week prior to that time.

The shortage in box cars totaled 82,523 on November 15, a decrease of 7,721 within a week, while the shortage in coal cars amounted to 42,827 cars, 2,702 fewer than on November 8. A decrease within the week of 4,130 was reported for stock cars, the total shortage amounting to 15,856. The shortage in refrigerator cars totaled 8,519, a decrease since November 8 of 2,264, while there also was a decrease within the same period of 69 in the shortage in coke cars which brought the total to 270 cars.

Reports filed with the Car Service Division also showed that at the same time there were 4,945 surplus freight cars of all classes and in good order scattered throughout the country on November 15.

Conference on Radio Standardization

The Bureau of Standards of the Department of Commerce has called a conference on radio standardization to be held on Friday, January 12, 1923, in New York City. The desirability of calling a general conference on radio standardization has been apparent in many ways, and this call is issued by the Bureau of Standards at the specific request of the following associations and organizations: Institute of Radio Engineers. National Radio Chamber of Commerce. Radio Apparatus Section, Associated Manufacturers of Electrical Supplies. National Retail and Dry Goods Association. American Radio Relay League. Radio Corporation of America.

The purpose of the conference is to consider broadly (1) whether a formulation of standards for radio apparatus and service shall be made, (2) if so what general classes of apparatus or service should be included, and (3) what procedure shall be recommended for carrying out the conclusions reached by the conference. If the conference decides that radio standards should be formulated, it is expected that they will be prepared with special consideration of the wide range of interests which are concerned with the subject, and that these standards may ultimately be adopted with the approval of the American Engineering Standards Committee as an American Standard.

Southern Iron Industry in Full Swing

The Southern Metal Trades Association advises that practically all furnaces now are operating in the Alabama district, and that a great majorty of furnaces throughout the South now are again in production, with tonnage as a whole for the entire district larger than it has been in almost three years. Extremely large tonnage orders are being received, and pig iron sales over the South are picking up steadily from week to week. Alabama district prices remain practically unchanged, ranging from $27.50 to $28.50. Considerable reductions in stock have been noted the past five or six weeks due to the large demand.

Class 1 Railroads Report Decrease in Earnings

Incomplete reports just filed by the railroads with the Interstate Commerce Commission show that 102 class 1 roads having a total mileage of 137,506 miles, had a net operating income in October of $51,761,300. This compares with $65,543,900 for the same roads in October, last year.

Operating revenues for the 102 roads totaled $332,952,900, an increase of 1.8 per cent above those for the same roads in October, last year, while operating expenses amounted to $261,070,300, an increase of 7.6 per cent above the same month in 1921.

Fifty-three roads in the Eastern district, representing a total mileage of 46,362 miles, had a net operating income in October of $23,579,900, compared with $30,565,500 for those roads in October last year.

Weights and Measures Men Meet December 8

The annual meeting of the institute will be held on Dec. 8, 1922, at 2 p.m. in Assembly Room No. 3 of the United Engineering Society Building, 29 West 39th St., New York City. The president will review the general situation affecting the activities of the Institute and make suggestions for the coming year.

A special feature of the occasion will be an address by A. G. Christie, professor of mechanical engineering, Johns Hopkins University.

New Locomotive Works for Poland

According to a report received from Poland, H. Cegielski of Posen, proprietor of extensive machinery works at that place, will start the erection of a third Polish locomotive manufacturing plant in the early part of next year. Largely interested in this new works is the well-known Belgian firm of Cockerill at Seraing in Belgium. Meantime the Polish Railway administration has placed an order for 100 locomotives with the above named Cockerill works, these engines to be delivered in the course of the year 1923. The construction of quite a number of important engineering plants is under consideration, Poland thus offering quite a market for machinery and tools.

First Radio Exposition

The first American radio exposition will be held in Grand Central Palace December 21 to 30. To date fifty manufacturers making radio apparatus have contracted for space, and these include the most important firms in the country. Added to what these makers will have to contribute, there will be various features from other sources to make the exposition a most interesting one.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(*Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York*)

ABOUT 60 years ago in an essay upon the United States, the great English economist, John Stuart Mill, said in effect that "the American people when confronted by a grave economic question have often seemed upon the point of answering it wrongly but their common sense has in the end prevailed and they have *acted* wisely."

The history of the United States since Mill made this observation has justified his confidence in the ultimate economic sanity of the people. The greenback movement, the free silver movement and various other economic heresies that have from time to time been popular have each died a natural death when it came to a final show down, and there seems to be every probability that the ghosts of radicalism by which the stock market has been so much scared since the election will soon be dissipated as by discussion the sunshine of common sense and intelligent self interest is directed upon them.

This at least seems to be the sober second thought of the American financial world and as a result the security markets have been stronger and their tone at the end of the week was distinctly better. There is no reason why a sound investment security should not be worth as much now as when it was selling 10 points higher. The value of the property which it represents is in most cases greater. The prices of commodities have not wavered, reports from industries and corporations have continued favorable, dividends in some cases have been increased and in others resumed after long lapses, and prosperity is widely advertised by the continuing distribution of corporation surpluses in the form of stock dividends. There is no doubt that an autumn trade of impressive volume is being carried on at reasonably profitable prices.

Money is, moreover, slightly easier and business men are mostly optimistic. These facts have been obscured by the political clouds coming out of the West, but they are becoming manifest to all who realize that few radicals live up to their promise once they get to Washington, and the indications seem to favor a gradual recovery in the stock and bond markets as investors regain confidence and commence to look for bargains.

The seasonal demand for money has apparently passed its peak. Interruptions in the heretofore continuous increase in the bill holdings of the Federal Reserve System have been reported and commercial loans of member banks have been declining fitfully since the middle of October. Our banking resources are so far in excess of the needs of commerce that interest rates are likely to decline again and surplus banking funds, as in the past, are likely to find their way into good securities which yield more than the going rate for money.

In the commodity markets no sensational movement of prices has taken place. Sugar advanced quite sharply. The Cuban stocks of old crop sugar are now completely exhausted but the new crop will be soon available and it is possible that its impact will cause a temporary decline.

Rubber is up to 27 cents as the prospect of co-operation in the control and limitation of supply becomes more definite. Cotton is quiet as the market waits for the Government estimate due December 12th, but the figures, whatever they may be, will not change the facts of supply and demand, which seem fairly equated at the current price level.

Hides have reacted slightly after a prolonged advance, but wool has been climbing higher almost every day for many months and no one in the trade seems to expect an early decline. The much discussed lagging of prices of agricultural products, which is held up as the chief obstacle to trade expansion, does not greatly affect cotton or wool, and the advances in grain and livestock have narrowed the price spread between the various groups of commodities more than has possibly been realized. As long as there is no unemployment and wages continue high further declines in commodities are not to be expected, and if the efficiency enforced by competition keeps down the costs of distribution and merchants do not unwisely force up prices by endeavoring to recoup all their inventory losses in this one season continued good trade seems to be assured.

Railroad earnings for October were somewhat disappointing. The failure of the roads to keep pace with the transportation needs of the country is clearly shown in recent figures of car loadings. Though more freight has been offered than at any time in the history of the country the roads have at no time succeeded in carrying as much as they did in the fall of 1920, and traffic congestion has increased the burden business has had to carry.

The intention of the Farm Bloc to force the much needed reduction in freight rates is therefore announced at an unfortunate time, for public opinion will favor some constructive action looking toward cheaper and more efficient transportation rather than arbitrary rate slashing, and in such action the compulsory consolidations contemplated by the law will occupy first place. These consolidations are therefore likely to become important stock market influences as time goes on. All industries are caught in more or less degree between the mill stones of high labor and material costs and the natural resistance of higher prices, and many of them are taking the merger route to effect savings in production and gain greater competitive power. The absorption by Bethlehem Steel of Midvale and Cambria,—providing the Federal Trade commission does not interfere—and the contemplated packers' merger are cases in point. Nor do I think the tendency should be discouraged. From big and open consolidations the public has much to gain and nothing to fear, because they can be quickly destroyed when they become oppressive.

The ship subsidy has passed the House, but it has been vitiated by the amendment which practically compels its renewal every year by Congress and there is small chance that it will pass the Senate. It will not be as much of a loss as believed by its supporters, who have been viewing its defeat through rose-colored glasses, and with the Government's income dropping off steadily its defeat will be a relief to tax payers.

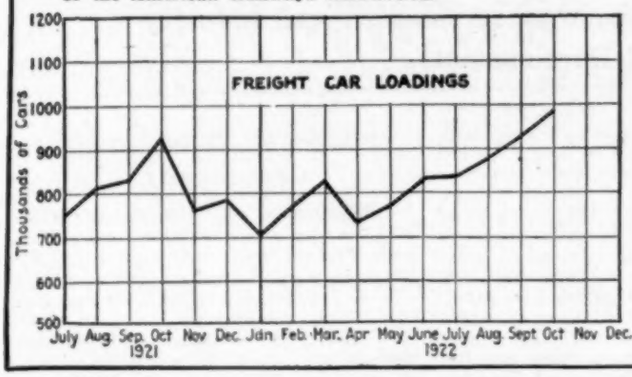
From abroad there was little significant news during the week, though the experiment of the Greeks in executing a few of the leaders who guided them to military disaster must be set down as worth attention and some may consider it a progressive step. The volume of German paper money is increasing so fast that the process threatens to become multiplication instead of addition, and it is only a question of time before the worthless mark is replaced by foreign currency. The reflections of Germany's weakness are apparent in the unsteady undertone of the foreign exchange markets, where further declines, except in sterling, are rather widely expected, and in the virtual cessation of the flotation of foreign loans in this country.

Postal Receipts Show Business Recovery

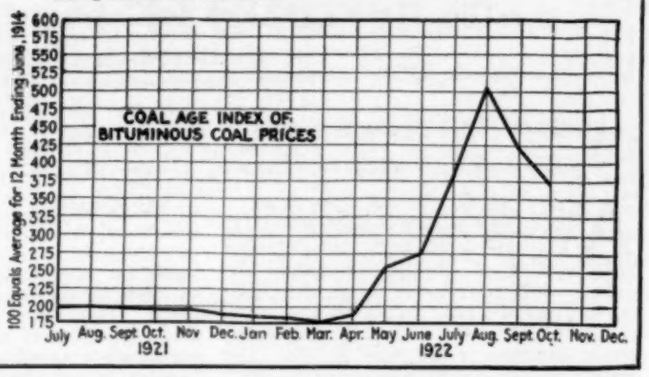
Present business recovery is reflected in United States postal receipts according to the National Bank of Commerce in New York. A review of these receipts for the past three years shows, furthermore, that they provide an index of both seasonal and cyclical variations in commercial activities.

"Reports from fifty representative cities throughout the country, covering the period from January 1920 to October 1922, evidence striking similarity in general seasonal trend," says the December number of the bank's magazine, *Commerce Monthly*. "Receipts are high in the early months of each year, reflecting spring trade. They decline with midsummer dullness and rise again with the coming of fall trade. They reach their peak with the arrival of Christmas activities.

Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.



Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.



FREIGHT car loadings mounted up rapidly during October with an average weekly loading of 992,219 cars for the month as compared with 936,386 in September. Beginning with 968,169 cars loaded for the week ending Oct. 7, there was a rapid increase each week, the loadings reaching 1,014,480 cars for the seven-day period ending Oct. 28, the highest point attained since 1920. Heavy loadings of coal, grain and merchandise were the features of the movement, only the serious car shortage preventing, doubtless, the highest loading mark ever recorded in American railroad history.

Automobile production for October recovered much of the ground lost during September, a total of 217,098 cars and 21,416 trucks being produced as against 187,128 and 18,656 respectively. As compared with October, 1921, there was an increase of 82,364 in cars and 8,603 trucks produced. The October production brings the total car output for the ten months of 1922 up to 1,913,439 and the truck output up to 200,302. The re-opening of the Ford factories and an adjustment of the coal situation were factors largely responsible for the increase over September. Production schedules for November indicate an output close to that of October.

Bituminous coal prices, as indicated by *Coal Age* index, continued their downward movement during October from the high point reached in August. The index for October was 370 as against 412 in the month previous, the spot prices for the same periods standing at $4.48 and $5.08 respectively. Continued mild weather during the month, a shortage of cars and a lack of demand for steam coal have been contributing factors in causing the price decline.

Comparative Prices of Shop Supplies

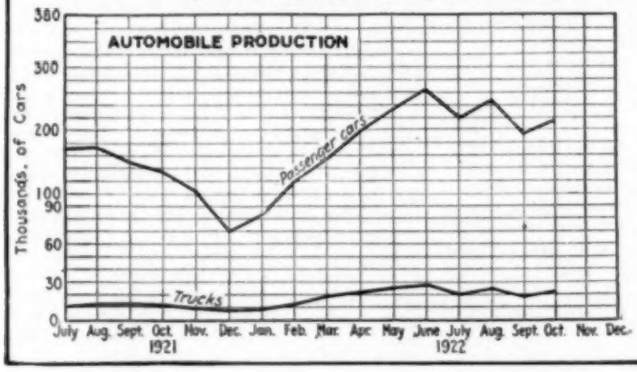
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.	$0.0295	$0.0295	$0.0273
Cold finished shafting	per lb.	0.0378	0.0378	0.0373
Brass rods	per lb.	0.171	0.1700	0.15
Solder (½ and ½)	per lb.	0.24	0.23	0.20
Cotton waste..	per lb.	0.11	0.11	0.122
Washers, cast iron (½ in.)	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth, No. 1, 6 in. dia	per 100	3.11	3.11	.....
Lard cutting oil	per gal.	0.59	0.575	.....
Machine oil	per gal.	0.36	0.36	.....
Belting, leather, medium	off list	30–10% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65–10%	50%@ 60–10%

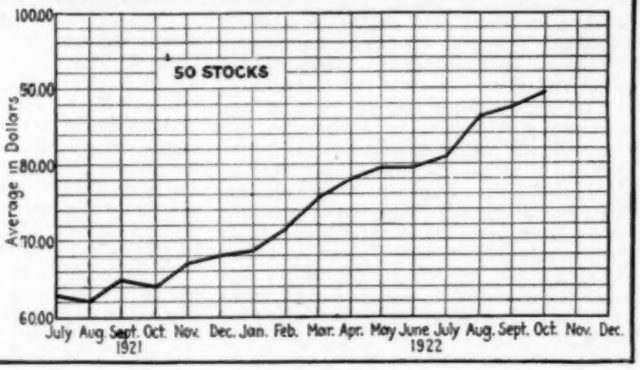
Share markets in New York, as reflected by daily compilations made by New York *Times Annalist*, show a continuance of the upward movement during the month, the average price of 50 stocks, 25 rails and 25 industrials, reaching $89.88 as against the September average of $87.85. The high point during the month was reached on Oct. 21 with an average of $91.32 from which mark prices declined to an average of $88.37 on Oct. 28. Industrial stocks continue to lead the upward movement, more particularly the railway equipment issues, all of which have booked a large volume of business.

Skilled metal workers are scarce and rates are high. In the New York district tool makers are being paid 75, bench hands and lathe hands 60 cents per hour. Philadelphia reports a range of rates which is wider and somewhat higher, toolmakers receiving from 60 to 90, bench hands 50 to 85 and lathe operators 50 to 90. The Detroit district range for toolmakers is between 75 and 80, bench hands 50 to 55 and lathe operators 70 to 75 cents per hour. Cleveland reports show toolmakers' rates ranging between 50 and 75, bench hands between 40 and 60 and lathe operators between 35 and 65.

Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Average for 1919, 138,138 cars; 26,364 trucks.



New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.



Business Conditions in England

General Outlook Brighter—Collapse of Germany and Taxation Retards Recovery—Machinery Industry Slightly Improved

BY OUR LONDON CORRESPONDENT

DURING the last few weeks, industrial affairs have been pushed aside in Great Britain by electioneering, and "the revolt of the under-secretaries" has brought about a position in which, as is usual, political affairs have been held of greater importance than more direct efforts to improve the economic position. It is, however, at last quite generally recognized that trade cannot be talked up and anyone who expresses the opinion that conditions are improving is usually now ready to put but a modest estimate on the immediate value of that improvement. We are learning very frequently and quite effectively that we are over-burdened with taxation, and that until this load is lifted real improvement cannot be expected. Colonel O. C. Armstrong, until recently the president of the Federation of British Industries, has expressed the opinion that the outlook is rather brighter than it has been during the past 18 months, but he went no further than to suggest that there are slight signs of revival in a certain number of industries. Few will assert that engineering and shipbuilding are among these; in fact it is sections of the textile trades and the coal trade that offer the most encouragement to optimism.

Effect of the German Collapse

We are now as a body perceiving what the collapse of Germany must mean, and have recently been told that, with Russia out of the market and Germany and Austria in the same position, we have lost some 12 per cent of our total export trade as done in the year before the war. It will be obvious therefore that even with the same population and the same standard of living it is necessary for us to find markets equivalent to those mentioned, and the suggestion is that, to effect the compensation, we should look to South America and the Far East. The latter area has in fact sent a number of enquiries of late, particularly for metal products. It has been urged that the British Colonies might take the place of the lost markets. But they have always been good customers, and their purchasing power for British goods, considering the unit of population, is much higher than that of our European markets. At the same time the total population, and therefore the total potential demand, is by no means comparable, and if Canada, Australia, New Zealand, and British South Africa are all regarded as a single market the population concerned is not equivalent to more than say three Londons.

Our figures relating to unemployment have been somewhat variable of late, but, after a setback of a few weeks, improvement is again being reported. Any movement of wages rates is nearly always a decline and so far during the year the official reports indicate a net reduction approaching four million pounds in the weekly wages of about seven and a half million people, any increases being almost negligible. The general percentage of unemployed trade unionists is more than 14½, the percentage of unemployed workpeople insured under the State scheme being nearly twelve. Although these figures indicate a condition which is bad enough, engineering as a whole is in worse case. According to a recent report of the Amalgamated Engineering Union, nearly 80,000 were unemployed or close on 25 per cent of the membership. Since the Armistice a sum of 281¼ million pounds has been expended officially on unemployment relief, one way and another. Even the undertakers are complaining: one such person included in the reasons for his business failure "bad trade caused by the prolonged low death rate."

Improvement in Steel Market

The latest report of the London iron and steel market suggests a slight improvement, with, to take one item, brisk business in the sheet steel market; but as regards stainless steels, while their applications are being extended attempts towards an increased rate of production are hampered by difficulty in obtaining greater supplies of chromium. Some of the home railways have been ordering rails and rolling stock. Also it is reported that orders are being placed for wagons by private traders for the first time since the de-control of the railways. In shipbuilding there has been some slight improvement and the practically depleted slipways, etc., of Vickers, Ltd., Barrow, will soon be partly occupied in the production of a 20,000-ton passenger liner for the Orient Company, with oil-fuel boilers and turbines driving through single-reduction gearing. Some measure of revival is expected in shipbuilding generally, as soon as wages have been re-adjusted. The Armstrong-Whitworth combination have obtained a contract for a floating dock at Southampton, the largest ever projected; its length will be nearly 1,000 ft., so that it will readily accommodate the "Majestic," which is 912 ft. long with a gross tonnage of 56,000. More than 20,000 tons of steel will be required and the work will occupy about eight or nine months. The dock is being constructed at the firm's shipyard at High Walker on the Tyne. Their old shipyard at Elswick is now occupied mainly by the locomotive works and pneumatic tool, small oil engine and other factories.

Boiler Makers Show Prosperity

In common with some other firms, Armstrong-Whitworth have secured orders for locomotives for India. The locomotive industry is not particularly flourishing, and in order to secure orders some very low prices have been quoted; in fact one firm has decided not to quote again until their competitors have sufficient work in the shop to prevent this practice of cutting. Whatever may be the case with other boiler-makers, Babcock & Wilcox, Ltd., continue prosperous, and have apparently placed their dividend on a regular 16 per cent basis, the reserve amounting to nearly two million pounds. Getting down to smaller items, for some reason or other, ball-bearing firms have been doing better of late.

Developments in air travel may be recorded, viz., the opening of the line from Manchester through Croydon, near London, to Rotterdam and Amsterdam, the journey occupying about four and a half hours. Extensions through Hamburg to Berlin are in contemplation, thus doubling the time of the journey.

How our automobile industry is handicapped by taxation, as compared with your own, was mentioned in the course of the annual dinner of the Society of Motor Manufacturers and Traders, when it was stated that per vehicle the average taxation on your side is £2, 8s. whereas on this side it works out at about £18, 17s. per annum. The society, by the way, will be exhibiting at the British Empire Exhibition of 1924, and a marine motor exhibition which will be held in 1923. The fortunes of the automobile industry have usually been thought to depend markedly on the result of the London Show; but some of its participants are becoming vocal on its excessive cost. According to a recent estimate our automobile production capacity is four times the home absorption capacity—hence the need for exports in this line.

Of the machine tool industry it will be sufficient to mention that some of the locomotive building firms have made extended trials with the oxy-acetylene cutting process for shaping frame plates on machines of planer type. A Gateshead maker of grinding machines has recently, by means of segmental blocks, removed by surface grinding 23 cubic inches of cast iron per minute and even more.

Westinghouse Ships Big Order to Chile

The third shipment of electrical equipment for the Chilean State Railway, consisting of six complete electric locomotives, the largest shipment of electric locomotives ever made, recently left the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Co. The shipment was valued at $700,000 and represented a partial fulfillment of the $7,000,000 contract awarded the Westinghouse International Co. by the Chilean State Railways.

Thirty-nine electric locomotives, 15 for road freight service, six for express passenger service, 11 for local passenger service and seven for switching service, are to be built by the Westinghouse Co. for the Chilean Railways. The six locomotives in the recent shipments are of the road freight type and weigh approximately 103 metric tons each. They are capable of maintaining an average speed of 35 miles per hour when hauling a 770 ton train on any part of the line between Valparaiso and Santiago, except the Tabon grade.

Washington Notes

By Paul Wooton

The Supreme Court has denied a motion for a writ of certiorari sought by Clarence E. Reed and the Reed Roller-Bit Company to review the decision by which the lower courts held for the Hughes Tool Company in the latter's claim that a patent was valid for an hydraulic force-feed lubricator employed with a rotary roller, oil-well drill-bit.

The Supreme Court has denied a writ of certiorari sought by the Pyle-National Company to appeal from the decision of the lower court dismissing its suit against the Oliver Electric Manufacturing Company alleging patent infringement of parts adapted for use in the Pyle locomotive headlight. The denial was on the ground that the petition was filed too late. The lower courts held that there was no infringement as the use of the parts from the Oliver company came within the repairs classification and that the headlight as a system was not duplicated. The Pyle-National Company had contended that only parts made by it were suitable for replacements.

The wage board at the Washington Navy Yard is understood to have recommended a reduction of one cent an hour in the pay of machinists. Under the present scale machinists are receiving 73 cents an hour. This reported action has brought forth a storm of protest from the machinists who are employed at the Navy Yard who contend that the board, under the law, must recommend an increase to 87.5 cents per hour, which they say is the rate of pay in private industry in the Washington region.

Legal Penalties Not Included in National Safety Codes

Clauses relating to legal penalties or to methods of enforcement will not be included in the safety codes approved by the American Engineering Standards Committee. This policy was established at a meeting of the A. E. S. C. in New York on Oct. 20.

This action was taken on the suggestion of the Safety Code Correlating Committee, which acts in an advisory capacity to the American Engineering Standards Committee.

It is the feeling both of the men engaged in the furtherance of standardization in industry and of practically all state officials that legal penalties for failure to conform with established state safety codes and methods of enforcement can best be decided by each state for itself.

Swedish Railways Try Motor Cars

Early in November the Swedish State Railways received the first three motor cars from a German firm at Kiel, to be tried on several sections of the railroad. These benzine motor cars are built of steel, having at each end a driver's stand, and capable of lodging 75 passengers. A benzine motor of 160 hp. acts as propelling power and the greatest speed is 80 kilometers per hour.

Novel Clock Tells Daily State of Your Business

Included among twenty-five forms presented in a treatise on budgeting as a means of business control, issued by the Fabricated Production Department of the Chamber of Commerce of the United States, is a novel clock arrangement by which the small manufacturer can tell at a glance the daily state of his business.

Clocks, or dials, are devised for each of the principal activities of the business. Each clock has two hands, a red one, pointed at the budget allowance, which remains stationary for the entire month, and a black hand, which is daily set at the amount of money spent by each department. The dials can be arranged so that they can be conveniently contained in a flat box 2 in. deep, 24 in. wide and 50 in. long, designed for hanging on the wall.

The idea was conceived and put into operation by a manufacturer of optical goods, who found that his organization could be conveniently divided into the following five groups: Material, Factory, Administration, Sales and Advertising. The five executives at the head of these departments are placed into a business of their own and are told what the results of their month's activities should be, together with the amount of money they may spend to produce these results. The Sales Manager is told how much in orders he is expected to get to keep the factory running; the Factory Superintendent, how much goods he must get out and how much accounts receivable he must create to provide the funds necessary in the following month; the Purchasing Agent, how much material is necessary to keep a well balanced inventory and to take care of the plans of the Sales Department; the Advertising Department and Administration, how much money they may spend in carrying out these plans.

A copy of the pamphlet "Budgeting for Business Control" may be secured by writing direct to the Fabricated Production Department, Chamber of Commerce of the Unted States, Washington.

Manufacture of Steam and Electric Railroad Cars: 1921

The Department of Commerce announces that the census reports show a decrease in activities of establishments engaged in the manufacture of cars for use on steam and electric railroads during 1921, as compared with the year 1919.

In 1921 there were 105 establishments engaged in the manufacture of steam-railroad cars and the total value of their products amounted to $314,394,867, as compared with 99 establishments for 1919 with a total value of products of $538,222,831. The decrease in the total value of products was $223,827,964, or 41.6 per cent.

During this same period there were 10 establishments engaged in the manufacture of electric-railroad cars and the total value of their products was $14,856,068 as compared with 7 establishments for 1919 with a total value of products of $18,441,976.

Iron and Steel Markets in September

Canada was the largest purchaser of American iron and steel during September, according to the Iron and Steel Division of the Department of Commerce, taking 41,417 tons. Japan held second place with 22,328 tons. The shipmnets to other important markets were: Cuba, 7,656 tons; Mexico, 6,193; Brazil, 6,133; China, 5,689; United Kingdom, 4,306; Chile, 4,229; Argentina, 4,145; Chosen, 3,403; India, 2,909; Australia, 2,403; Colombia, 2,303; Philippine Islands, 2,224; Peru, 1,562; Rumania, 1,463; Venezuela, 1,304; Hongkong, 1,074; British South Africa, 979; and Panama, 978 tons.

The decline in total iron and steel exports which began in June continued through September. The total for the month amounted to 130,728 long tons, only 57 per cent of the exportation during May, which is the record month of the year, and a drop of 11 per cent from the August figure.

Total exports for the first 9 months of 1922 were 1,597,204 long tons, composed principally of steel rails, black steel sheets, iron and steel bars, and rods other than wire, and boiler tubes.

Further Decline in Structural Sales

A marked seasonal decline in the sales of fabricated structural steel in October is announced by the Department of Commerce from reports made to the Bureau of the Census. October sales amounted to 54.9 per cent of shop capacity, compared with 61.6 per cent in September.

Reports received from 140 identical firms from April through October, with a shop capacity of 221,790 tons per month, show the following actual tonnages booked each month and the percentage of shop capacity represented by these bookings. A revision of these capacities in accordance with a uniform standard is now being undertaken by the Bureau of the Census but the results are not yet complete.

	Tonnage Booked	Per Cent of Capacity
April	191,05	86.5
May	172,260	77.7
June	153,278	69.1
July	141,907	64.0
August	143,515	64.7
September	136,587	61.6
October	121,763	54.9

Austro-Russian Industrial Syndicate Formed

A number of well known Austrian machinery companies, including the Linz Locomotive Works of Linz, the Austrian Arms Factories of Steyr, Ltd., of Steyr, and Brevillier & Urban have formed a syndicate with several Russian firms for the purpose of marketing the Austrian product in Russia as well as to establish new factories in Russia. All kinds of machinery and tools will be made and sold, and special interest will be paid to agricultural machinery for which there exists a tremendous demand all over Russia, and especially in the Ukraine and the Caucasus. It will be well remembered that these districts were formerly very extensively supplied by American manufacturers.

Market for Machine Tools in Dutch East Indies

The markets in the Netherlands East Indies in 1921, says the Bureau of Foreign and Domestic Commerce, absorbed more than four times as much machinery as in 1911. During that period the share of this business secured by American manufacturers has expanded nearly 22 times, namely, from 264,000 guilders to 5,701,000 guilders (1 guilder=$0.402).

The following table is given from the statistics published by the government of the Netherlands East Indies, giving the returns for 1920 and 1921, and shows the machine tools and other machinery imported into the archipelago, as well as the principal countries of origin and the extent of the participation of each:

IMPORTS OF MACHINE TOOLS IN 1920 AND 1921

		Machine Tools	
		Value in Guilders	Per Cent of Total
United States	1920	865,165	6.7
United States	1921	890,370	19.4
Great Britain	1920	947,298	7.3
Great Britain	1921	517,441	11.3
Netherlands	1920	3,301,131	25.4
Netherlands	1921	2,279,957	49.7
Germany	1920	448,489	3.8
Germany	1921	740,958	16.2

IMPORTS OF OTHER MACHINERY AND TOOLS IN 1920 AND 1921

		Other Machinery and Tools	
		Value in Guilders	Per Cent of Total
United States	1920	3,908,266	25.7
United States	1921	2,372,946	12.7
Great Britain	1920	2,047,808	13.5
Great Britain	1921	2,521,888	13.5
Netherlands	1920	7,390,396	48.6
Netherlands	1921	10,145,387	54.5
Germany	1920	1,086,485	6.9
Germany	1921	2,634,318	14.1

American participation in the machinery trade of this archipelago is really much greater than the above figures would indicate, because the customs returns makes no allowance for trans-shipment cargo, and German, British, and American machinery shipped by way of the Netherlands would be credited to the latter country. Vast quantities of machinery are so shipped.

The sales problem for this territory, therefore, is complicated by the fact that large quantities of machinery for use in this archipelago are purchased in the Netherlands. Ordinarily it will be found necessary to arrange for sales effort in both the Netherlands East Indies and the Netherlands if a consistent program is to be developed for covering this territory. The Bureau of Foreign and Domestic Commerce can supply information regarding machinery dealers covering this territory.

The market in the Netherlands Indies is a very attractive field for sales effort for a number of reasons. In contrast with conditions in Europe, the exchange ratio is not very unfavorable and the fluctuations in exchange have settled down to narrow limits. Business is practically stabilized, and it would appear that these markets have escaped from the worst of the influences resulting from the war.

This territory is a very large one, extending a greater distance from east to west than the width of the United States and from north to south a distance comparing to that from Canada to the Mexican border.

Japan Importing Heavily from Germany

Japanese imports from Germany have been increasing and are now greater in volume than before the war, according to Japanese periodicals received by the Department of Commerce. For the year ended May, 1922, these imports amounted to 83,310,000 yen (1 yen equals $0.4985), an increase of 22,150,000 yen over the 1913 imports.

The amount of imports from Germany for the first five months of this year exceeded by some 35,000,000 yen that for the first five months of last year, and it is generally believed that this year's total will be over 100,000,000 yen, if the same rate of increase is maintained until the end of the year.

Bulgarian Imports of Steel and Machinery

The Bulgarian Government has just published the statistical returns for the year 1921, according to which the country imported 185,785,000 Lewa worth of machinery and 351,784,000 Lewa worth of iron, steel and manufactures thereof. The machinery imports consisted chiefly of agricultural machines and implements, all kinds of industrial machinery, machine tools and saw-mill machinery.

Compiles Five Foot Book-Shelf of Foreign Trade

The completion of a Selected Bibliography of Foreign Trade, 1922, in which are listed the leading authorities on various aspects of International Commerce, is announced by the National Foreign Trade Council, of India House, Hanover Square, New York, from whom copies can be obtained.

This Five Foot Book-shelf of Foreign Trade contains fifty titles dealing with training for foreign trade, the history and geography of foreign trade, the practical administration of an export business, and with all phases of ocean transportation.

Advice on Export Problems Offered by Experts

The organization of a Trade Adviser Service to act throughout the year as a medium for the interchange of experience on foreign trade problems, was announced today by the National Foreign Trade Council, India House, New York.

"This service," says O. K. Davis, secretary of the Council, "is intended to provide foreign traders with a confidential answer to those intimate, personal, or unusual problems which cannot be handled in a satisfactory manner through existing Governmental or private agencies. It will be of very practical assistance to foreign traders in improving the technique of export organization, sales methods, foreign advertising, commercial credits, traffic management and similar matters.

The general chairman of the Trade Adviser Service is E. P. Thomas, President, U. S. Steel Products Co.; A. E. Ashburner, American Multigraph Sales Co., is vice-chairman; and C. J. Warren, Remington Typewriter Co., is executive chairman.

Big Italian Steel Works Reorganized

Reorganization of the Ansaldo Steel Works is being effected by the formation of a new company, bearing the same name, having a capital of 200,000,000 lire divided into 1,000,000 shares of 200 lire, says Consul Leon Dominion, Rome, in a report to the Department of Commerce. According to press notices, the Banca Nazionale di Credito has subscribed for 1,250 shares, and the Gio, Ansaldo Co. for 998,750 shares. The new company has taken over the principal plants of its predecessor, among which are the Sampierdarena machine shops and locomotive works, Sestri Ponente dockyards, Borzon yards, Fegiano railroad car works, Campi cannon foundry, Delta steel works at Cornigliano Ligure, Campi electrical works, Multedo iron foundry, Cornigliano steel works and bronze and aluminum plants.

The purchase price of these establishments is stated to be 28,405,800 lire, and payment has been made to the old Ansaldo Co. by means of 142,029 shares of the new company. The new company furthermore assumes liabilities amounting to 40,261,339 lire on bonds issued for the account of the plants it has taken over and which are guaranteed by mortgages.

About 45,000,000 lire in bonds remains in the hands of the old company, which also retains its ownership in the Cogne mines, Aosta hydro-electric plants, Murlo lignite mines near Siena, Pa manganese mines near Sassari, Lauriano Po cement and lime factory near Turin, automobile factory at Turin, and dockyards at Voltri.

Commercial Travelers' Guide to South America

The new revised edition of the "Commercial Travelers' Guide to Latin America" has just been released by the Department of Commerce. It is an encyclopedia of the countries south of the United States. It is the only complete and up-to-date "Baedeker" for the traveler. Everything that a foreign representative should know is included within its 698 pages; salesmen's equipment, steamship routes and railroads, connections and rates, schedules of sailings, postal and cable services and rates, hotel accommodations in the various cities, restrictions on travelers, duties on samples and advertising matter.

Whether you may wish to reach Bogota or Barinas the little volume will tell you how to get there. Every Latin-American market is listed and described, and every city of any importance is fully covered. It contains suggestions and advice as to the best time of the year to visit certain countries, the best methods to be employed in covering a territory or approaching a prospective field. It is replete in sound advice to the uninitiated and helpful hints to the experienced traveler. This work is the result of years of careful tabulation, research, and first-hand study by Mr. Filsinger, assisted by a corps of experts of the Department of Commerce in Washington. The price is $1.25 prepaid and may be secured by application to the Superintendent of Documents, Government Printing Office, Washington, D. C.

Immigration Policy To Be Taken Up by Congress

With one bill already being whipped into shape, and a marked revival of interest by organizations concerned in the subject, it is probable that the question of a permanent immigration policy will occupy much more attention at the winter session of Congress than had been anticipated last summer when the temporary 3-per cent quota law was extended for two years.

The only concrete proposal that has made its entrance into general capitol comment thus far, and which it is understood is being drafted into a bill, is to replace the 3 per cent law with one permitting annual admission of quotas equal to 2 per cent of the foreign born residents of the United States according to the sensus of 1910, divided by nativity, and with the stipulation that an entire family of immigrants, regardless of its number, shall be considered as a unit. This stipulation naturally would increase the number admitted above the actual 2 per cent. Experts are studying immigration reports to determine just what effect this would have on the actual inflow.

The general sentiment of congress, however, appears to favor some form of selective immigration, coupled with a maximum limitation feature. There has been no definite centralization of ideas on this point, however.

It had been expected that determination of a permanent immigration policy would be left for the Sixty-eighth Congress, inasmuch as the temporary law now runs until June 30, 1924, but the subject is being agitated to such degree that action may be taken by the present Congress before it expires.

Business Items

The New Process Gear Co., Syracuse, N. Y., has sold the entire issue of $2,000,000 first mortgage 6½ per cent bonds to S. W. Strauss & Co., New York City.

The Stanley Rule and Level Co., New Britain, Conn., has begun work on a 60-foot addition to its forging department on Summer St., Southington, Conn.

The American Can Co. declared a dividend of 1¼ per cent on the common stock. This is the first dividend on the junior issue since the company was organized in 1901. The dividend is payable Feb. 15 to stockholders of record Jan. 31. The regular dividend was also declared on the preferred stock.

The Charles E. McGill Machine Co., recently organized in Binghamton, N. Y., by Charles E. McGill, for several years president of the McGill & Holford Co. of that city, have started operations on Commercial Ave., where they will produce their line of textile machinery. Plans have been made for a modern factory to be erected during the coming year.

The Studebaker Corporation, in its report for the third quarter, shows a total production of 87,951 cars as against 56,163 in 1921. The total production for 1922 is expected to be about 110,000.

The Imperial Electric Co., Akron, Ohio, has completed a new foundry, and outside work in brass castings will be taken on, officials of the company announced last week. The new plant is the only oil burning foundry in Akron. Samuel B. Myers, formerly of Dayton, is now identified with the plant, having been connected with the Utah Copper Co. before going to Dayton.

The Langhaar Ball Bearing Co., Aurora, Ind., is now building a new factory and remodeling an additional shop adjoining the structure, the company's business having outgrown the present capacity.

The American Screw Co. directors have voted a fifty per cent stock dividend and have called a meeting of stockholders for Dec. 1 to approve the action. The company has now $3,000,000 stock outstanding and at the end of 1921 its surplus was $2,962,372.

The Waterbury Rolling Mills, Inc., makers of brass, bronze and nickel silver sheets, of Waterbury, Conn., has recently increased their capital stock from $200,000, to $600,000.

The Branford Brass Foundry Co., Inc., of Branford, Conn., incorporated a few weeks ago to engage in the brass foundry business, organized the past week by the election of the following officers: Hugh A. Cox, president; Frederick A. Ells, secretary; and Robert L. Rosenthal, treasurer.

The American Pin Co., manufacturer of brass goods, pins, etc., of Waterbury, Conn., has recently increased its capital stock from $600,000 to $1,500,000.

The Stanley Works, New Britain, Conn., manufacturers of rules, levels, etc., has recently purchased property on Elm Street, their city, from the New Britain Machine Co., and the Damon Coal Co. The property will be utilized for their own operations.

The Manufacturers' Association of Bridgeport, Conn., held their annual meeting during the past week, and elected the following officers for the ensuing year: George M. Eames, of the Singer Manufacturing Co., president; Summer Simpson, president of the Raybestos Co., first vice-president; T. Rice Davis, second vice-president; and R. G. Farrell, treasurer.

The Western Iron Stores Company, Milwaukee, Wis., John A. Camm, president, held a house-warming in its newly organized and arranged store, on Saturday, Nov. 25.

The Alexander Millburn Co., Baltimore, Md., has been appointed exclusive representative of the Wilson Welder and Metals Co., 132 King St., New York City, for its products in Maryland, Virginia and the District of Columbia. The company will carry in Baltimore a large stock of color-tint welding metals and plastic arc welding machines for distribution in that territory.

The Ford Motor Co. of Canada, according to reports, will let a contract in the near future for a new factory at Ford, Ontario, with a floor space of approximately 625,000 square feet and of one story steel construction. One of the features of the new structure will be the application of direct motor drive throughout instead of overhead transmission. It is expected that the new plant will be in operation by May or June of next year.

Personals

Charles S. Cole, president of the Premier Manufacturing Co., novelty manufacturers, etc., Sandy Hook, Conn., has recently been made president and a director of the W. & B. Douglas Co., manufacturers of pumps, of Middletown. Conn.

DALE D. BUTLER, secretary of the W. & B. Douglas Co., manufacturer of pumps, etc., Middletown, Conn., has recently been elected president of the Middletown Chamber of Commerce.

MARSHALL CUTTING, formerly with the Wickwire-Spencer Steel Corporation, of Worcester, Mass., has recently accepted a position with the Wiley-Bickford-Sweet Co., Worcester, as credit manager.

GEORGE R. WOODS, general manager of R. S. Stokvis & Sons, Inc., New York City, has returned from a business trip to his home office in Holland.

FREDERIC HAVEY, foreign sales and relations manager for the Saco-Lowell Shops, manufacturers of cotton and textile mill machinery, Boston, Mass., recently returned from the International Textile Machinery Exhibition, in Bradford, England.

W. B. ANDERSON, manager of the Boston branch office of the Barber-Colman Co., manufacturers of milling cutters, hobbing machines, etc., Rockford, Ill., has been appointed a member of the finance commission of Swampscott, Mass., for a period of three years.

GEORGE MACNOE, manager of the Boston office of W. B. Connor, Inc., has been recalled to New York to take charge of the contractors' sales department, handling heating and pumping equipment.

J. S. TOOHEY, formerly with the Wallace Tractor Co., Racine, Wis., is now with the Racine Tool and Machine Co., as chief engineer.

A. A. HELLER has taken over the management of the International Oxygen Co., Newark, N. J., in place of L. W. Hench, secretary and general manager, resigned.

C. G. BIGELOW, formerly associated with the American Sheet and Tin Plate Co., has been appointed chief mechanical engineer of Jones & Laughlin Steel Co., at their South Side plant to succeed M. W. Hale who resigned recently.

FRED C. SEVERIN, formerly with the Betts Machine Co., and B. H. TRIPP, for a number of years associated with the Chicago Pneumatic Tool Co., have formed a partnership to deal in used machine tools, with offices at 25 Church St., New York City.

CHARLES E. BEESON has been elected vice-president of the Pittsburg Steel Co. He has been connected with the company since 1901 and has served as a director and member of the executive committee.

W. C. REITZ, secretary and treasurer of the Pittsburg Steel Products Co., has been made a director of the Pittsburg Steel Co.

E. R. SMITH has been made vice-president of the Fitchburg Machine Works, makers of the Lo-Swing lathe.

L. F. CARLTON, for eighteen years connected with the Consolidated Press

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Nibbling Machine, Rapid

A. C. Campbell, Inc., Waterbury, Conn.

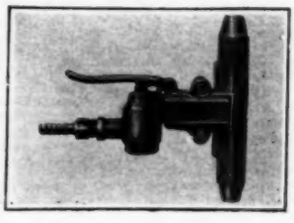
"American Machinist," October 12, 1922

The machine is for cutting irregular forms from sheet metal, celluloid, or fiber and is a small punch press that does its cutting by means of a cylindrical punch and die. The work may be pushed or pulled in any direction by hand, or the machine follows a templet attached to the sheet. The punch has a central pilot, and the ram is so set that this pilot does not at any time come above the surface of the work. Closed outlines may be cut. With an attachment, circles of any size up to 28 in. in diameter can be cut. The double-ended reversible punches are about $\frac{7}{16}$ in. in diameter.

Vibrator, Pneumatic, for Foundry Use

Malleable Iron Fittings Co., Branford, Conn.

"American Machinist," October 12, 1922



The vibrator or "rapper" is intended for use chiefly in the corerooms of foundries for rapping core driers or core boxes when removing cores. It operates upon the principle of a pneumatic hammer, but is not intended to deliver a blow of any moment. It may be used anywhere that a supply of air under a pressure of 20 lb. or greater is available. It may be kept on the molding bench, so that it can be picked up as readily as a mallet and pressed against the work.

Casehardening Compound, "Nitrol"

American Kreuger & Toll Corporation, 522 Fifth Ave., New York, N. Y.

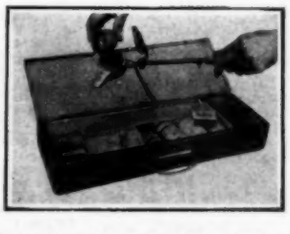
"American Machinist," October 12, 1922

The compound is a nitrogenous powder that can be employed for surface-hardening iron and steel under practically any condition. Rusty objects can be hardened as well as polished ones. The compound is furnished in two grades, Grade A being used for surface hardening and Grade E for pack hardening to depths up to $\frac{1}{16}$ in. The Grade A or sprinkling powder melts at 1,200 deg. F., and does not give off poisonous or obnoxious fumes. Cast steel or alloy pots similar to those employed for cyanide may be used. When carburizing in pots, the parts are packed with Grade E Nitrol and then heated in the usual manner up to 1,475 to 1,550 deg. F. for from three to eight hours. The parts are removed and quenched in the usual manner, either directly from the box or reheated to 1,425 deg. F. and quenched.

Soldering Iron, Heated by Chemical Action

International Sales Co., 921 Southern Bldg., Washington, D. C.

"American Machinist," October 19, 1922

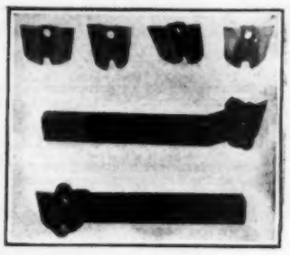


The soldering iron does not employ heat from an outside source, but utilizes chemical reaction to bring it to the proper temperature. In a receptacle cast in the soldering iron is placed a small tin container holding the required mixture. The head of a special match is inserted through an opening, a perforated lid closed over the receptacle and the protruding match-end lighted. Instantly an intense white glow appears through the holes in the lid and the iron is ready for use. The heat from this application lasts about 10 min. The iron and a supply of briquets and matches are housed in a metal-lined box with a hinged lid and handle.

Toolholder and Interchangeable Cutters, Combination

Morris Tool Co., Inc., 30 Church St., New York, N. Y.

"American Machinist," October 12, 1922

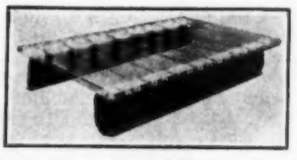


At the cutting end, the holders have two projecting arms in which bolts hold the cutters. By turning the holder over and fastening the blade on the other side the height of the cutting edge is changed. Both straight and angle holders can be furnished. Each blade has two cutting edges. They are made for turning, cutting-off, threading and facing. It is merely necessary to grind the top slope when sharpening cutters. The large cross-sectional area provides for conducting the heat from the cutting edge, so that heavy-duty work can be performed. Holder sizes, twelve, from $\frac{3}{4}$ x $\frac{3}{4}$ x 4 in. to $2\frac{1}{4}$ x 3 x 24 in. Blade thickness: from $\frac{1}{4}$ to $1\frac{1}{4}$ inches.

Platform, Lift-Truck, "Steeleg"

Barrett-Cravens Co., 1328 W. Monroe St., Chicago, Ill.

"American Machinist," October 12, 1922

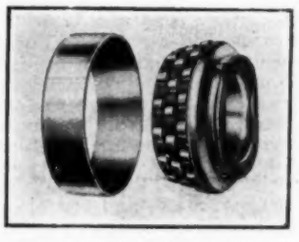


The top of the platform is made of wood and can be furnished from $\frac{1}{2}$ to 2 in. in thickness, depending upon the class of work for which it is intended. Flathead countersunk bolts fasten the boards to the steel legs or skids. The legs are made of heavy-gage flanged steel plate and have vertical ribs to prevent buckling. The upper flange has a wide bearing for the top, and a turned-up edge which protects the ends of the boards. The legs do not wear or shrink as wooden skids do, so that the truck can always be run under the platform.

Bearing, Roller, Radial and Thrust

Whitney Bearing Corporation, 467 E. Ontario St., Chicago, Ill.

"American Machinist," October 12, 1922



The rolling action is obtained in this bearing by means of cylindrical disks. The periphery of each disk is parallel to the axis, and the diameter is twice the thickness, regardless of size. Both conical surfaces of the bearing have the same angle. The rollers operate between parallel surfaces to eliminate the end thrust and friction occurring on tapered rollers. The load is transmitted to the face of the roller only in a direction perpendicular to the axis of the roller. The several series of rollers are carried in separate ring cages. The adjustment spring is automatic and keeps a uniform pressure on the bearing.

Indicator, Speed, No. 748

Brown & Sharpe Manufacturing Co., Providence, R. I.

"American Machinist," October 19, 1922

The indicator registers the number of revolutions of shafting, motors and revolving parts in either direction, and measures both high and low speeds equally well. The design of the indicator is different from that of the former models. The readings are taken on one side only. The device can be quickly set at zero and registers up to 5,000 revolutions by steps of five revolutions, although much faster speeds can be determined. The two arrows on the face of the dial indicate the figures to use for the different directions of rotation. The figures showing through the small round windows on the dial register steps of five revolutions directly. The small inside dial registers hundreds of revolutions. The fiber handle serves as an insulation for the operator against electricity. Three points are furnished, a steel point for ordinary speeds and rubber points for high speed.

Clip, paste on 3 x 5-in. cards and file as desired

Co., has been appointed Western sales manager of the V. & O. Press Co., designer and manufacturer of high grade power presses and sheet metal working machinery, Brooklyn, N. Y. He will make his headquarters at 549 Washington Boulevard, Chicago, where the company has established its office, and it is intended to carry a stock of presses in that city for immediate shipment.

Obituary

HEDLEY P. CARTER, vice-president, treasurer and sales manager of the H. C. Cook Co., manufacturers of sheet metal novelties and tools, Ansonia, Conn., died at his home in that city Nov. 19. Mr. Carter, who was 51 years old, and was very well known in manufacturing circles throughout the East. He came to the Cook Co., five years ago, from the Stanley Works, New Britain, Conn., with which concern he was associated for 16 years.

CHRISTIAN LOUIS BERGER, founder of and for sixty years actively engaged in the management of C. L. Berger and Sons Co., Boston, manufacturer of scientific instruments, died Nov. 19, at 80 years of age. Mr. Berger was born in Stuttgart, Germany, and came to America in 1862. He is survived by two sons, Louis H., and William A., both active in the management of the business.

HENRY L. KINSLEY, Wellesley, Mass., New England representative of the Warner & Swasey Co., machine tools, died Nov. 22, at the Natick Hospital, Natick, Mass., following an operation. Mr. Kinsley appeared on the road to recovery immediately after the operation, but on Tuesday serious complications developed. He was a native of Stoughton, Mass., and was born 68 years ago. Practically all his business life was spent in the machine tool industry. He represented the Warner & Swasey Co. with offices at Boston for more than 15 years, and probably was one of the best known machine tool men in the New England territory. Previous to his association with the company he was with the Fairbanks and the Manning, Maxwell & Moore companies.

Book Reviews

The Manufacture and Uses of Abrasive Materials. By Alfred B. Searle. One hundred twelve 4 x 6¼ in. pages, illustrated. Cloth boards. Published by Isaac Pitman & Sons, 2 W. 45th St., New York, N. Y. Price 85 cents.

This book is one of a series known as Pitman's Technical Primers. It is a brief, well written book on grinding, to be recommended, among other reasons, because it is elementary. Beginning with definitions of abrasives and the action of removing metal by grinding, the reader is led through chapters on raw materials, preparation of abrasive materials, manufacture of abrasive blocks, wheels, papers and cloths, polishes, selection of abrasives, testing abrasives and polishes, and the erection and operation of machines and wheels.

No attempt is made to give elaborate descriptions and illustrations of individual grinding operations, nor are the practices of individual concerns related. In that respect generalities are adhered to, the author satisfying himself with explaining the various kinds of grinding machines and operations. Definitions are plentiful and well stated. On the whole, a valuable book.

Stores and Materials Control. Including Procurement by Manufacture and by Purchase. By Madison Cartmell, Consulting Industrial Engineer. Four hundred forty-five 6 x 9 in. pages, with illustrations of report and record forms. Cloth boards. Published by the Ronald Press Co., 20 Vesey St., New York, N. Y. Price $4.50.

This book is characterized by its thoroughness and its clarity. The author did a hard job well and did not quit until he was through. In scope, the book is pretentious, undertaking to cover principles of materials control, procurement by manufacture, procurement by purchase, and the problem of what system to adopt. Yet when the importance of stores and materials control is realized, it is seen that the whole field, as chosen by the author, must be covered, in order to make a book sufficiently comprehensive for the needs of management. Such realization justifies the treatment of the general subject of the procurement and handling of materials, from the initiation of the order for their purchase of manufacture to the shipment of the finished product.

The first part, under the general heading "Introductory," treats of the problem of materials control and the organization of control.

Part two, "Principles of Control," takes up the records and mechanism of control, the stores record form, pricing the stores records, operating the stores records, classification and symbolization, symbolization of cost records, the costing of orders, control of inventory, standards and specifications, arranging and equipping the storesroom, stowing material, taking inventories, organization of the materials control department.

The third part, "Procurement by Manufacture," includes the subjects of organization of the production control department, graphic production control, operation of production control mechanism.

Part four, "Procurement by Purchase," tells of the function of the purchasing department, the article, the market, seller and buyer, the price, the written contract, effecting the delivery, the completion of the purchase contract, some legal aspects of purchasing, organization and personnel.

Part five, "Adopting a System" explains systems, records and forms.

While the subject of materials control has been explained as it applies to both large and small organizations, it is treated more particularly from the viewpoint of the large plant. That viewpoint was taken because the author believes that "basic principles apply to both classes alike," and that "the only safe policy for the small plant that is to hold its own lies in simplifying and adapting the methods tested out in the big plant and found essential to sound operation, without slurring over or emasculating them."

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Electric labor-saving devices, fractional horsepower electric motors, electric lamp shades and fittings, wireless sets and appliances, felts of all kinds, canvas, duck, and leather cloth, linoleums, automobiles-hood cover materials, pressed and molded glassware, glass lamps, chimneys, tools, emery, flint, and glass paper, general hardware, especially patented hardware—Australia. Agency desired. Terms, cash against documents. Reference No. 4432.

Electrical supplies, such as lamp cord, fixtures, glassware, electric globes, motor appliances, heater appliances, insulators, dry and wet batteries and specialties—Peru. Agency from manufacturers desired by representative in the United States. Reference No. 4439.

Steam engine of 50 horsepower, to be supplied by an existing English water tube boiler with pressure of 120 pounds; also punching and slotting machinery; high-speed machine lathes; band saw for steel, leather, and wood; and small furnace for iron and brass foundry, with crucible one-half ton capacity—Brazil. Purchase desired. Quotations, c.i.f. Brazilian port. Terms, cash against documents. Reference No. 4490.

Trade Catalogs

Portable Electric Tools and Shop Equipment. The Black & Decker Manufacturing Co., Baltimore, Md. Catalog No. 5 for 1923 which has just been issued by this company is a fine example of the printer's art and the Black & Decker organization deserves praise for the excellent arrangement of the illustrations and subject matter. The company's complete line of portable electric tools and shop equipment devices is shown with an illustration for each type. The complete specifications with other matter of general interest is set forth for each machine. Featured in the publication also are the company's lectroflater electric compressor, the No. 2 hand lectroflater, the No. 2 wall lectroflater and the No. 2 carriage lectroflater.

Drill Presses. The Sibley Machine Co., South Bend, Ind. This company has issued a new catalog describing the features of its line of single spindle drill presses. Points of especial interest are described in detail and specifications for each type are included.

Lithoform. The American Chemical Paint Co., 1126 South Eleventh St., Philadelphia, Pa. A process for making paint hold to galvanized iron is described in a new publication, Bulletin No. 9-B, just issued by this company. The publication tells what Lithoform does, gives directions for its use and treats of the Lithorizing process as applied to galvanized iron.

Multi-Graduated Precision Thread Grinders. The Precision and Thread Grinder Manufacturing Co., 1932 Arch St., Philadelphia, Pa. A new catalog, consisting of bulletins, in loose-leaf binder, has just been issued by this company containing a general description of its line of products. The various styles of machines are illustrated with a detailed discussion of the construction, use and maintenance of each.

Forthcoming Meetings

Eighteenth Annual Automobile Salon, Commodore Hotel, New York City, December 3 to 9, 1922.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

American Institute of Weights and Measures, annual meeting December 8, 1922, United Engineering Societies' Building, 29 West 39th St., New York City. Chas. C. Stutz, 115 Broadway, New York City, is secretary.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922, Grand Central Palace, New York City. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

National Automobile Chamber of Commerce, National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

National Automobile Chamber of Commerce, Nationa Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16, Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

American Foundrymen's Association, Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

New and Enlarged Shops

Machine Tools Wanted

Ala., Attalla—Attalla Motors Co.—machine shop equipment.

Conn., New Britain—B. F. Clark, South Main St.—equipment for proposed automobile service station.

Ia., Dubuque—Belsky Motor Co., 6th and Iowa Sts.—repair machinery for garage, including lathe, drill press, air compressor, etc.

Kan., Wichita—G. Manlove, 115 West 2nd St.—South Bend power lathe, (used preferred).

Ky., Louisville—Pittsburg Fuel Co., 231 West Main St.—16 or 18 in. lathe with power attachment.

Mass., Boston—Keystone Mfg. Co., 53 Wareham St., (manufacturer of metal toys)—geared type punch press with 4 in. stroke, Bliss or Consolidated preferred (used).

Mich., River Rouge—Whitehead & Kales, South Dearborn St., (structural steel and machine work), M. Davis, Purch. Agt.—complete tool and die room equipment; also machine shop equipment, including lathes, millers, shapers and multiple drill.

Mo., Webster Groves—Webster Groves Auto Repair Co.—medium size power punch press.

N. Y., Buffalo—J. Ballatin, 1722 Jefferson St.—machinery, tools and equipment for $75,000 automobile sales and service station.

N. C., Raleigh—Structural Supply Co., Box 1133, (steel and iron products), D. B. Irwin, Purch. Agt.—sheer and punch, 6 x 3½ in. angles, 6 x ½ in. flats, ¾ in. through ⅞ in.; lathe for bolt threading, 1½ in. max.; small drill press, 1½ in. through 1 in.; forge, rivet portable hand blower; bar bender, 1 in. square, cold bend; also equipment for light structural plant (used.)

O., Cleveland—Cuyahoga Boiler Wks. Co., 1210 Main St.—belt driven power punch, 18 to 22 in. throat, to take ⅞ in. hole in 3.4 in. material (new or used).

O., Cleveland—W. L. Streit, 2336 West 42nd St.—one 36 in. bar folder and a 36 in. squaring shears.

O., Columbus—C. J. Maddox, 16 East Broad St.—compressor, blacksmith and machine shop equipment for the Buckingham Mines, Ltd., Asquith, Twp., Ont.

O., Dayton—G. W. Shroyer & Co., 2nd and Main Sts.—machinery, tools and equipment for automobile sales and service station.

Pa., Pittsburgh—Pittsburgh & Lake Erie R.R., South Smithfield St., C. M. Yohe, Purch. Agt.—42 in. boring mill with side head; also a 24 in. shaper.

Va., Ashland—Fuqua & Stone (automobile repairing)—drill press.

Va., Ashland—Rawlings Motor Co.—drill press.

Va., Fredericksburg—City Repair Shop, City Manager, Purch. Agt.—10 ft. lathe and drill press.

Va., Fredericksburg—Dice Motor Co.—lathe and drill press.

Va., Fredericksburg—Fredericksburg Motor Co., 613 Princess Anne St.—drill press.

Va., Fredericksburg—A. S. Haislip Motor Co., Princess Anne St., L. Bowie, Purch. Agt.—lathe for repair shop.

Va., Fredericksburg—Horton & Simpson, 105 Commerce St.—reamer for automobile repair shop.

Va., Fredericksburg—C. M. Humphry & Son, 605 Commerce St.—lathe and drill press for automobile repair work.

Va., Fredericksburg—W. B. Jenkins, 65 Princess Anne St.—25 cycle motor, single phase, 110 volt a.c.; also lathe.

Va., Fredericksburg—Jones Motor Co.—shop tools, wrenches, vise, etc.

Va., Fredericksburg—Service Motor Co.—lathe, drill and bench tools.

Va., Hopewell—F. Bowles—lathe, drill press and other machinery for automobile repair shop.

Va., Hopewell—Petersburg Motor Co.—lathe, drill press, etc.

Va., Hopewell—Red Front Garage—lathe and drill press.

Va., Richmond—Godsey & Fry, 718 East Cary St. (machine shop)—milling machine.

Va., Richmond—C. E. Johnson, 822 West Main St. (machine shop)—No. 3 or 4 milling machine, 20 in. lathe, 20 in. shaper, medium drill press and bench tools.

Va., Richmond—H. E. Lang, 10 South Madison St. (welding and repair shop)—large lathe.

Va., Richmond—Seventh St. Garage and Repair Shop, 7th and Leigh Sts., C. A. Skinner, Purch. Agt.—drill press.

Wis., Chippewa Falls—F. A. Bigler, 15 River St. (garage)—drill press, air tanks, gasoline storage tank and pump.

Wis., Eau Claire—Automobile Gasoline Gauge Mfg. Co., c/o E. G. Kuehl, 1607 Emery St.—machine tools and machinery for the manufacture of gauges.

Wis., Eau Claire—J. C. Blaski—automobile repair machinery for proposed garage.

Wis., Eau Claire—K. N. Knudson, 307 North Farwell St.—repair shop equipment and air tank for proposed garage.

Wis., Eau Claire—Paige-Ford Motor Car Co., Wisconsin and North Farwell Sts.—repair shop machinery for proposed garage.

Wis., Lancaster—Grant County, H. Mink, Highway Comnr.—drill press, chain hoist and grinders for repairing road machinery.

Wis., Milwaukee—W. A. Sandrock Co., 1217 4th St. (structural steel)—punch press.

Wis., Waupun—Landaal Bros. Co.—automobile repair machinery for proposed $50,000 garage.

Wis., Wausau—Hall Garage Co., 107 Scott St.—automobile repair machinery for proposed $40,000 garage.

Wis., Wisconsin Rapids—Wood County Bd., c/o E. Morris, Comr.—machine shop equipment.

Ont., Wiarton—G. Golden, Berford St.—complete equipment for proposed $45,000 garage and automobile repair shop.

Machinery Wanted

Calif., Los Angeles—R. J. Fleming, 506 Bryson Bldg.—cannery equipment for plant, capacity 20,000 cans per 10 hour run, tomatoes chief product; also saw mill equipment, to be used in connection with cannery to be erected in Mexico.

Calif., Orange—N. T. Edwards—ice manufacturing machinery.

Colo., Seibert—Seibert Settler (newspaper)—cylinder press for power equipment.

Conn., Bridgeport—J. H. Southey, 576 Gurdon St. (machinery dealer)—3 elevating trucks or transveyors, 18 x 30 in. bed, 8 to 10 in. rise.

Fla., Ocala—Marion County Ice Co.—electrical ice making machinery.

Fla., St. Petersburg—Times, P. Poynter, Purch. Agt.—No. 8 or No. 14 linotype machine.

Ga., Cogdell—Morse Lumber Co.—woodworking machinery, including boring and turning machines.

Ill., Chicago—Blue Valley Creamery Co., 700 South Clinton St.—butter making and cream separator equipment for proposed creamery at Duluth, Minn.

Ill., Chicago—United States Gypsum Co., 205 West Monroe St.—machinery and equipment for proposed gypsum block plant at Oakfield, N. Y.

Ind., Evansville—Mid-States Rubber Co., c/o J. Hopkins, Secy., Never Split Seat Co., Morgan Ave.—machinery and equipment for rubber products plant.

Ind., Indianapolis—N. Todd, 415 Lemcke Bldg.—ice manufacturing and cold storage machinery and equipment.

Ind., New Haven—New Haven Silk Hosiery Co., H. Bauer, Purch. Agt.—labeling machines, bobbins and skein winding machinery.

Ia., Dubuque—P. T. Bowen, 2127 Gold St.—special mixing machinery for the manufacture of magnesite stucco.

Kan., Baxter Springs—Dr. J. H. Boswell—zinc mill equipment, crushers, rollers, belting, pulleys, shafting and bearings (used preferred).

Kan., Wichita—Business Printer, St. Croix Hotel, 116 North Topeka Ave.—job printing equipment.

Kan., Wichita—C. W. Owens, c/o G. W. Miller, 112 East 2nd St. (job printer)—power job press with Miller feeder (used).

Kan., Wichita—G. Roderick, 1112 East Douglas Ave.—Barned saw machine, jig saw, belting, planer, boring machine, Stanley miter box and small tools for cabinet making.

Ky., Louisville—National Forge Co., 1572 Cherokee Rd., W. Clark, Pres.—foundry equipment.

Me., Lewiston—W. S. Libbey Co.—machinery for new woolen mills at Hinsdale, Mass.

Md., Cambridge—Dorchester Fertilizer & Lime Co., L. Webster, Pres.—complete machinery and equipment for fertilizer plant (new).

Mass., Boston—Tileston & Hollingsworth Co., 49 Federal St.—additional machinery for paper plant at 892 River St., Hyde Park.

Mass., Gloucester—Savoy Dye House—additional machinery for laundry and dye house, including extractors, motors, etc. (used).

Mass., Waltham—Clayton Mfg. Co., 157 High St., (knit goods), E. Clayton, Purch. Agt.—one Scott & Williams, 18 in., 10 cut machine and one Shields automatic cutting and piling machine.

Mich., Detroit—G. B. Bright Co., Engrs., Marquette Bldg.—96 ton ice making machine for plant of Random Lake Ice Co., 064 Locust St., Milwaukee, Wis.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., Congress St., G. J. Finn, Comr.—one automatic electric welding outfit for the Dept. of Street Railways.

Mich., Detroit—Michigan Stamping Co., 11631 Mack Ave.—equipment for making metal stampings, for proposed addition to plant.

Mich., Highland Park—Ford Motor Co.—equipment, consisting of conveyors, transferring and assembling machinery for proposed assembly plant at Chicago.

Mich., St. Joseph—J. T. Townsend—refrigerating machinery (motor).

Mo., Chula—C. S. Steel—job printing press, newspaper press, paper cutter, linotype, belting, hangers, shafting, bearings and pulleys.

Mo., Joplin—Joplin Mchy. & Renting Co., 301 Virginia Ave., A. E. Maitland, Purch. Agt.—14, 16 and 18 in. rock crushers; also 24 and 26 in. rolls (used).

Mo., Joplin—Landreth Mchy. Co., 301-5 East 4th St. (machine shop)—vertical boilers, 3 to 12 hp.; also 2 air compressors up to 250 ft. capacity.

Mo., Joplin—White Mining Co., 1518 Kentucky Ave., O. White, Purch. Agt.—6 Chicago pneumatic air compressors, belting, hangers, shafting, crushers, rolls, bearings and gas engine.

Mo., St. Louis—The Bd. of Pub. Serv., 208 City Hall—Two 200 hp. oil burning, water tube boilers, 2½ ton ice plant and 10 ton refrigeration plant for proposed service station and power plant, at St. Louis Training School for Feeble Minded at Scott Farm.

Mo., St. Louis—G. A. Bull, 6026 Waterman Ave.—2 oil pumps and 2 tanks for filling station on Hogan and North Market Sts.

Mo., St. Louis—Grace Sign & Mfg. Co., 425 South Main St.—shafting and small machines for proposed sign factory on 2nd and President Sts.

Mo., St. Louis—Modern Auto Parts Co., 1803 Park Ave.—dollie, rectifiers and welding parts.

Mo., St. Louis—Oak Hill Express and Transfer Co., 3609 Gravois Ave.—550 gal. oil pump and tank for use at 4119 Fairview Ave.

Neb., Saint Edward—Advance—25 lb. light 12 point type, mailer and other printing equipment.

N. Y., Ashville—W. F. Meyer—machinery and equipment for cider mill to replace that which was destroyed by fire.

N. Y., Buffalo—Automatic Tire Machine Co., 19 Push St.—machinery and equipment for proposed factory for the manufacture of tire machines and appliances.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Copper outlook improved, electrolytic, quoted at 14⅜c. as against 14¼c. per lb., in New York warehouses. Zinc prices also working higher; 7⅝c. quoted, as compared with 7¼c. per lb. last week. Lead market quiet with slight advance in East St. Louis. Linseed oil demand small but prices steady; lubricating oils, however, firmer in price with market slightly improved.

Declines—Pig-iron prices continue to decline. Steel shapes, plates and bars still frequently quoted under the $2 per 100 lb. level. Independent makers, however, adhere to the $2 base on steel plates; with attractive tonnages on railway equipment quoted as low as $1.90@$1.95. Heavy buying of tank plates, for oil storage continues.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	30.27
Southern Ohio No. 2	30.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	35.27
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	31.64
Virginia No. 2	37.17
Basic	27.50
Grey Forge	29.14
CHICAGO	
No. 2 Foundry local	30.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.50
Basic	27.50
Bessemer	30.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
New York	5.5
Chicago	4@5
Cincinnati	4.5
Cleveland	2.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.60	4.19	3.70	4.00
No. 12	2.60@2.70	4.24	3.75	4.05
No. 14	2.70@2.75	4.29	3.80	4.10
No. 16	2.90@3.05	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.30	4.75
No. 28	3.35@3.50	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.50	4.90	4.40	4.85
Nos. 12 and 14.	3.45@3.60	5.00	4.50	4.95
Nos. 17 and 21.	3.75@3.90	5.30	4.80	....
Nos. 22 and 24.	3.90@4.05	5.45	4.95	5.40
No. 26	4.05@4.20	5.60	5.10	5.55
No. 28	4.35@4.50	5.90	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	66	54½	⅜ to 1¼	34	19
LAP WELD					
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	64	53½	⅜ to 1¼	34	20
2 to 3	65	54½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
⅛	8.00		12@13
1/16	6.50		11@12
3/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.37½
Tin, 5-ton lots, New York	36.87½
Lead (up to carlots), St. Louis....6.95@7.00; New York.	7.50
Zinc (up to carlots), St. Louis.....7.05@7.10; New York.	7.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	23.00	23.00
Antimony (Chinese), ton spot	7.25@7.37½	8.50	7.75
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.00	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ¼), (caselots)	27.50	24.50	20.00
Babbitt metal (83% tin)	35.00	47.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	11.75	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.50	5.75
Lead, tea	4.25	4.50	4.75
Brass, heavy	7.00	9.75	9.25
Brass, light	6.00	5.50	6.00
No. 1 yellow brass turnings	6.50	6.75	7.00
Zinc	3.00	4.00	4.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
	Coke Plates, Bright			
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
	Terne Plate			
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.90	1.01	.95
White lead, dry or in oil	100 lb. kegs.	New York, 13.25	
Red lead, dry	100 lb. kegs.	New York, 13.25	
Red lead, in oil	100 lb. kegs.	New York, 14.75	
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$7.25@7.50	
Coke, prompt foundry, Connellsville	per net ton	7.50@8.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/8 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	50–5%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	65–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

N. Y., Buffalo—Kittinger Furniture Co., 1893 Elmwood Ave.—machinery and equipment for furniture factory.

N. Y., Buffalo—J. H. Knepper & Sons, Inc., 1430 Main St.—machinery, tools and equipment for plumbing and steam fitting shop.

N. Y., Buffalo—National Brake Co., Ellicott Bldg.—machinery and equipment for proposed plant for the manufacture of brakes and brake equipment at Bridgeburg, Ont.

N. Y., Brooklyn—Wyona Knitting Mills, 493 Vermont St., G. Schwartz, Purch. Agt. —knitting machinery.

N. Y., East Aurora—Zapf Lumber Co.—machinery and equipment for new planing mill.

N. Y., Fort Covington — International Tape Co., J. F. LaCombe, Purch. Agt.—belt lacing machines.

N. Y., Geneva—Bd. Educ., C. W. Rice, Pres.—vocational equipment or proposed high school.

N. Y., Hamburg—Bd. Educ.—vocational equipment for $200,000 high school.

N. Y., Jamestown — Jamestown Store Front Co., 29 North Main St. (manufacturer and installer of store fronts and equipment)—complete machinery and equipment to replace that which was recently destroyed by fire.

N. Y., Johnson City—Endicott-Johnson Co. (manufacturer of shoes) — machinery and equipment for proposed factory at Binghamton.

N. Y. New York — L. Schlenker, 255 Center St (dies)—one 100 lb. drop hammer.

N. C., Anderson (Edenton P. O.)—Anderson Tractor Co., W. S. Anderson, Pres.—machinery and equipment for the manufacture of tractors.

N. C., Carthage—Sugg Bros. (machinists, etc.), L. R. Sugg, Purch. Agt.—portable keyway cutter and acetylene welding outfit.

N. D., Underwood — Underwood Dry Cleaners—dry cleaning machine.

O., Ashland—J. E. Matthews Produce Co. —cold storage machinery and equipment.

O., Columbus — Bd. Educ., Tower and High Sts., E. L. McCune, Clk.—receiving bids until Dec. 11 for two 12 in. speed lathes, three 30 in. band saws and other equipment for manual arts department.

O., Columbus—Columbus Brick & Terra Cotta Co., Kresge Bldg., W. T. Matthews, Purch. Agt.—brick making equipment for plant at Union Furnace.

O., Columbus—J. S. Maclean & Son, 150 West Spring St., (manufacturer of office furniture, etc.)—woodworking machinery, saws and planer.

O., Delaware—Automatic Incubator Co., W. McKenzie, Pres.—will take bids early in 1923 for woodworking machinery and some metal working equipment for incubator plant.

O. Ottawa—G. W. Kahle—woodworking machinery.

O., Sandusky — Blackwood Steel Fdry. Co.—foundry equipment for casting factory at Parkersburg, W. Va.

Pa., Allentown—V. B. Boyer, 242 North 11th St.—abattoir equipment, refrigeration machinery and cold storage equipment.

Pa., Ambler—E. Ott, 724 Rosemary St. (laundry)—washing machines, 4 or 6 pocket capacity.

Pa., Canton (East Canton) — Silverdale Creamery Co.—complete mechanical cooling system for milk plant.

Pa., Corry—D. A. Hillstrom—furniture manufacturing and woodworking machinery.

Pa., Freedom—Freedom Oil Wks. Co., E. Craig, Mgr.—span crane.

Pa., Germantown (Phila. P. O.)—Chetland Worsted Mills Co., Hains and Stanton Sts.—one Whitin quiller with one 378 spindle 2½ in. gauge; one Davis & Furber bobbin winder with 96 spindle (used).

Pa., Lebanon—Lebanon Honey Cake Cone Co.—cone making machinery for proposed factory.

Pa., Lebanon — Livingwood Mfg. Co. (manufacturer of metal stoves and camping outfits)—machinery and equipment for factory.

Pa., Marcus Hook — Cellulose Products Co., Inc., C. A. Cammillo, Purch. Agt.—braiding and twisting mcahinery.

Pa., McKees Rocks—Federal Enameling & Stamping Wks.—machinery and equipment for 3 story steel works.

Pa., Phila.—H. C. Aberle & Co., A and Clearfield Sts. (manufacturer of hosiery)—full fashion machines, sewing machines and loopers.

Pa., Phila.—Amer. Ice Co., 6th and Arch Sts.—conveyors, etc., for proposed ice plant on 17th St. and Washington Ave.

Pa., Phila.—Baccellieri Bros., 924 South 11th St., (manufacturers of furniture), P. Baccellieri, Purch. Agt.—turning machines, planers, saws, tenons etc.; also kilns for lumber for new factory at Berlin, N. J.

Pa., Phila.—Bennett & Aspden Co., Krams and Pechin Sts.—additional broad looms for proposed addition to textile mill for the manufacture of upholstery.

Pa., Phila.—P. Brosz, 2511 West Huntingdon St., (woodwork, etc.)—band saw, planers, etc., for new shop.

Pa., Phila. — Brown-Pneips Hosiery Co., 21st and Clearfield Sts., T. E. Brown, Purch. Agt.—additional knitting machines, etc.

Pa., Phila.—Bush & Diamond, Jasper and Thayer Sts.—broad looms and accessories for proposed rug factory.

Pa., Phila.—The city, 316 City Hall, T. F. Armstrong, Purch. Agt.—50 ton refrigerating plant for city hospital.

Pa., Phila. — Continental Leather Co., Tacony St. and Van Kirk Ave.—additional leather working machinery for new plant.

Pa., Phila.—Stephen Green Co., 15th and Arch Sts.—presses and other printing equipment for proposed plant on 34th and Market Sts.

Pa., Phila. — Jones Printing Co., 1515 Sansom St., W. Jones, Purch. Agt.—presses, paper cutter and accessories for plant.

Pa., Phila.—Merchants & Evans Co., 2035 Washington Ave., A. Evans, Purch. Agt.—cutting machines, brakes, furnaces and sheet metal working machinery for new addition.

Pa., Phila.—J. H. Reed, 435 North Broad St.—automatic full fashion hosiery machines, etc. for new plant.

Pa., Phila.—Rodgers Engraving Co., 1318 Arch St.—machinery and equipment for proposed engraving and printing plant.

Pa., Phila.—Wolstencroft Felt Mfg. Co., Mulberry and Bridge Sts., I. H. Wolstencroft, Purch. Agt.—additional sets and finishers for the manufacture of felt.

Pa., Pittsburgh — Duquesne Steel Fdry. Co., Farmers' Bank Bldg.—equipment for foundry, to replace that which was destroyed by fire, at Kendall (Coraopolis P. O.).

Pa., Pittsburgh—D. L. Hamlin, Inc., 123 38th St.—grain conveying machinery.

Pa., Pittsburgh—Union Steel Casting Co., 62nd and Butler Sts.—crane.

Pa., Pottstown—G. W. Corbett, 63 High St. — foundry equipment for the manufacture of steel castings.

Pa., Pulaski—Pulaski Grist Mill, W. McConnell, owner—machinery and equipment.

Pa., Sharon—Sharon Furniture Mfg. Co., 288 Wilkes Pl.—saw and saw table.

Pa., Shatington—J. A. Brush—printing machinery and equipment for new 3 story plant.

Pa., Uniontown—Brown Coal Co.—electric coal tipple machinery and equipment.

Pa., Warren — Colonial Rug Wks., 410 Laurel St., C. M. Mayhood, Purch. Agt.—dyeing machinery and looms for the manufacture of rag and fluff rugs.

Pa., Watsontown—Watsontown Door & Sash Co.—machinery and equipment for addition to factory.

Pa., Williamsport—Standard Wood Pipe Co., East Jefferson St.—sawmill equipment.

Pa., Woodlawn—Bd. Educ.—equipment for vocational department of new $250,000 high school.

R. I., Pawtucket—Bd. Educ.—vocational equipment for proposed $1,200,000 high school.

R. I., Woonsocket—Rhode Island Knitting Co., Jeffers St.—equipment for proposed addition to knitting mill.

S. C., Greenville—E. M. Wharton, Davenport Apartments—stamped steel automatic loom stop, recently patented.

S. C., Kingsville (Gadsden P. O.)—Congaree Timber Land Co., J. E. Belzer, Pres.—lumber and sawmill machinery.

Tenn., Chattanooga—Continental Mchy. Co., G St.—machinery and equipment to replace that which was destroyed by fire.

Tenn., Chattanooga—Gager Lime & Mfg. Co., James Bldg., M. P. Kennedy, Secy.—stone washer and crushing machine, 200 ton capacity.

Tenn., Memphis — DeSoto Hardwood Flooring Co., 1014 Sledge Ave., R. A. Taylor, Mgr.—equipment for proposed addition to plant.

Tex., Bonham—Catron Mfg. Co. (manufacturer of pumps, etc.)—machinery and equipment for plant (new).

Tex., Canyon—Bd. Educ.—vocational equipment for $100,000 school.

Tex., Comfort—Faust Motor Co.—about a dozen pieces of sheet metal or tin working machinery.

Tex., College Station—A. & M. College Print Shop—proof press, stand, single and double galley press for power equipment.

Tex., Kerens—J. W. Maby & Co. (sheet metal)—8 or 10 ft. cornice brake.

Tex., San Antonio — Freeman Printing Co.—pony cylinder press, 25 x 38 in., Meihle preferred, power attachment.

Va., Alexandria — Herfurth Engine & Mchy. Co.—300 ft., 3 lb. air blower (used); oil engine, 75 to 100 hp. (used); 7½ x 7½ in., 9 x 9 in. and 10 x 10 in. ice machines, belt driven, enclosed type (used.)

Va., Ashland—R. J. Chisholm, R.F.D. 4—gas engine, mandrel and a 28 in. circular saw.

Va., City Point—Wilson-Hock Co., (machinery, etc.), N. Wilson, Mgr.—8 in. steam separator; rotary dryer about 7 ft. diameter, 90 ft. long, to dry with direct or semi-direct heat 50 ton of limestone per hour; outfit to dry-grind mica to 75 or 80 mesh.

Va., Fredericksburg—J. E. Brickert & Co., 903 Charles St.—test bench complete with armature winder and under cutter, also small lathe and electric hand motor.

Va., Front Royal—Proctors Grist Mills—complete machinery to replace that which was destroyed by fire.

Va., Hopewell—Hopewell China Plant—clay working machinery.

Va., Hopewell—Hopewell Printing Co.—pony press.

Va., Hopewell—Tubize Artificial Silk Co., J. L. Brown, Purch. Agt.—spinning machinery.

Va., Richmond—Allegheny Box Co., 601 Byrd St. (manufacturer of wooden boxes)—multiple boring machine.

Va., Richmond—S. E. Kane, 119 South Lombardy St. (printing)—cutting and stapling machines, also job press.

Va., Richmond—E. T. Macdowell, 203 East Main St.—12 x 18 in. job press, paper cutter and stapling machine.

Va., Richmond—Palace Steam Laundry, 303 West Cary St., C. D. Griffis, Purch. Agt.—3 washers, one 26 in. extractor and collar and cuff machinery.

Va., Richmond — Richmond Corrugated Paper Co., 7th and Byrd Sts.—combination roll, rewinder and sheet chopper.

Va., Richmond—R. A. Siewers, 612 Cumberland St. (contractor)—4 siding machines.

Va., Richmond—T. & E. Laundry Co., Inc., 926 West Broad St., L. E. Hardy, Purch. Agt.—whole shirt unit, collar and cuff machinery and 2 large washers.

W. Va., Charleston—Griffith, Foster & Rhodes—equipment for the manufacture of skylights, blow pipes, heating systems, etc.

W. Va., Glen White—E. E. White Coal Co.—machinery and equipment for proposed coal tipple.

Wis., Belgium—Krier Preserving Co.—canning machinery, belting, shafting, power equipment, including boilers, engines, pumps and steel stack for cannery at Random Lake.

Wis., Crandon—F. H. Himes—planing and sawing machinery for proposed saw and planing mill.

Wis., Eau Claire — Lang Canning Co., Mill St.—canning machinery, belting and shafting for proposed addition to cannery.

Wis., Green Bay—J. C. Krueger, 1009 Crooks St.—sheet metal working machinery.

Wis., Hartland—J. Hurley—dairy and power machinery for proposed factory at Hustisford.

Wis., La Crosse—Anderson Vulcanizing Co., 215 State St.—vulcanizing equipment.

Wis., Madison—Karnack Studios Co., 24 East Wilson St., T. Munchow, Purch. Agt. —equipment for the manufacture of incense burners, metal and plastic art novelties, etc.

Wis., Madison — Madison Supply Co., 615 East Washington Ave.—power and bottling machinery for proposed bottling works.

Wis., Menomonie—Dunn County, F. Stewart, Comr.—$12,750 worth of road machinery, including patrol graders and equipment for county repair shop.

Wis., Milwaukee—C. Daniel, 1741 Teutonia Ave. (carpentry and millwork)—one band saw.

Wis., Milwaukee—Excel Mfg. Co., 3402 South Pierce St. (millwork) — additional woodworking machinery.

Wis., Milwaukee—P. Hoff, 64 Locust St. —ice making machinery, electrically driven.

Wis., Milwaukee—Milwaukee Auto Specialty Mfg. Co., 711 Chestnut St., W. J. Raley, Purch. Agt.—one paper press.

Wis., Milwaukee—Milwaukee Enameling Co., 406 6th Ave., J. M. Reitzler, Purch. Agt.—enameling ovens.

Wis., Milwaukee—Milwaukee Times, 349 Grove St., H. Towell, Purch. Agt.—one stereotyping outfit and one cylinder press, motor power.

Wis., Milwaukee—Palmolive Co., 42 4th St.—soap making machinery and kettles for proposed addition to factory.

Wis., Milwaukee—J. J. Tadyck, 1394 8th Ave.—sheet metal working machinery.

Wis., Milwaukee—Vollbrecht Cut Stone Co., 753 Canal St., A. J. Vollbrecht, Purch. Agt.—traveling crane.

Wis., Milwaukee—Wisconsin Steel & Dock Co., 253 3rd St., (marine repairs, etc.), F. W. Stevens, Purch. Agt.—power saws.

Wis., Rosholt—M. C. Colrud—feed grinding machinery with gasoline engine or motor power.

Wis., Wausau—Marathon Shoe Co., 1st Ave. and Cedar St.—additional shoe working machinery for proposed factory.

B. C., Kilgard—Comrs. of Sumas Dyking Dist.—receiving bids until Dec. 28 for an 8 ton hand operating traveling crane. Estimated cost $4,000. G. P. Moe, Kilgard, Engr.

N. B., St. Johns — Stephen Brick Co., Prince William St.—machinery and equipment to replace that which was destroyed by fire.

N. B., St. Johns—Stetson-Cutler & Co.—sawmill equipment.

Ont., Collingwood—Canadian Postal Lock Nut Bolt Co., F. A. Bassett, Mgr.—equipment for the manufacture of bolts, screws and rivets, later for steel stamping.

Ont., Ford — Ford Motor Company of Canada, P. W. Grandjean, Secy.—special metal working machinery for the manufacture of autos and tractors.

Ont., Goderich—W. Baechler—machinery and equipment for proposed woodworking plant and sawmill.

Ont., Hamilton—Duro Constr. Co., Ltd., 306 Landed Bank Bldg., C. W. Bowser, Purch. Agt.—woodworking and general contractors equipment.

Ont., Harrow—T. R. Flood Flour Mills—equipment to replace that which was destroyed by fire.

Ont., Mount Dennis—Electroplax Co. (manufacturer of insulation equipment)—machinery and equipment for plant to replace that which was destroyed by fire.

Ont., Owen Sound—Bd. Educ., W. H. Wright, Chn.—general equipment, including tools, woodworking and metal working lathes, etc., for proposed technical school, physics and chemistry laboratories.

Ont., Paris—Penmans Ltd.—equipment for proposed woolen mill at St. Hyacinthe, Que.

Ont., Petrolea—B. P. Corey—special equipment for making oil, grease and soaps for proposed factory.

Que., St. Lambert—J. Duncan—sawmill equipment to replace that which was destroyed by fire.

Ont., St. Marys — W. Zurbrigg, c/o J. H. Jameson—complete equipment for proposed saw and planing mill at Rannoch.

Ont., Stratford — Stratford Frames & Novelties—woodworking machinery, (new).

Ont., Welland—Welland Cotton Co., J. T. Grantham, Pres.—machinery and equipment for proposed cotton mill.

Ont., Wiarton—Gilpin Bros.—$30,000 worth of woodworking machinery and equipment for the manufacture of flooring and woodenware specialties.

Que., Montreal—Thomas Gold Mining Co., Ltd., 810 Drummond Bldg., T. H. Carveth, 227 Girouard Ave., Pres.—stamp mill and other machinery for mine in Thomas Twp., Porcupine Mining Division, Ont.

Metal Working Shops

Conn., Plantsville—The Blakeslee Forging Co. awarded the contract for the construction of a 2 story, 40 x 42 ft. forge building. Estimated cost $15,000. Noted Oct. 19.

Conn., Waterbury—The Brass City Machine & Tool Wks., 29 Pearl St., is receiving bids for the construction of a 2 story addition to its factory for the manufacture of special machinery. Estimated cost $40,000. L. S. Kipp, 121 Charles St., Engr. and Archt.

Mass., Cambridge—The Cambridge Motor Co., 195 Massachusetts Ave., awarded the contract for the construction of a 2 story, 55 x 200 ft. garage and automobile sales and service station, with 62 x 66 ft. wing, on Massachusetts Ave. and Front St. Estimated cost $150,000.

Minn., St. Paul—The Hamm Realty Co., 681 Minnehaha St., plans to build a 2 story, 150 x 150 ft. garage on 8th and Sibley Sts. Estimated cost $100,000. Architect not announced.

Mo., St. Louis—The Auto Car S. & S. Co., Locust and Leffingwell Sts., awarded the contract for the construction of a 1 story, 134 x 155 ft. garage and service station at 2740 Locust St. Estimated cost $60,000.

Mo., St. Louis—The Automatic Sprinkler Co., c/o T. Sheehan Plumbing Co., 15th and Olive Sts., awarded the contract for the construction of a 2 story, 40 x 110 ft. sprinkler assembly plant, on Olive St. Estimated cost $25,000.

Mo., St. Louis—The Haynes-Langenberg Mfg. Co., 4045-57 Forest Park Blvd., will soon award the contract for the construction of a 3 story, 150 x 200 ft. furnace factory on Bircher St. near Euclid St. C. W. Morton, 1339 Syndicate Trust Bldg., Engr. G. O. Langenberg, c/o owner, Archt. Noted Nov. 23.

N. H., Manchester—C. H. Macrury, 1042 Elm St., awarded the contract for the construction of a 3 story, 50 x 50 ft. garage on Burch and Lowell Sts. Estimated cost $50,000.

N. Y., Brooklyn—M. Galtabiano, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., will build a 1 story, 100 x 100 ft. garage on Decatur St. and Wyckoff Ave. Estimated cost $40,000.

N. Y., Buffalo—The Williams Gold Refining Co., 2978 Main St., plans to build an addition to its factory. Estimated cost $10,000. Architect not announced.

N. Y., Lackawanna (Buffalo P. O.)—The Lackawanna Steel Co. is having plans prepared for the construction of additions to mills, also new rail and steel mills, furnaces and various shops. Cost will exceed $15,000,000. W. A. James, Ch. Engr.

N. Y., Rochester—The Rochester Taxicab Co., 58-64 Plymouth Ave., N., awarded the contract for the construction of a 2 story, 90 x 200 ft. garage. Estimated cost $125,000.

O., Dayton—The G. W. Shroyer Co., 2nd and Main St., is having plans prepared for the construction of a 2 story, 50 x 200 ft. automobile sales and repair station on North Main St. Estimated cost $60,000. Private plans.

O., Norwood—The Chevrolet Motor Co., General Motors Bldg., Detroit, awarded the contract for the construction of a 2 story, 320 x 500 ft. automobile assembly plant on Smith Rd., here. Noted Nov. 16.

O., Springfield — The Fairbanks Piano Plate Co., Kenton St., plans to rebuild portion of its factory, which was recently destroyed by fire. Estimated cost $40,000.

O., Toledo — The Chevrolet Motor Co., General Motors Bldg., Detroit, awarded the contract for the construction of a 1 story, 91 x 450 ft. automobile transmission plant, here. Estimated cost $225,000.

Pa., Erie—The Northwestern Motors Co., 21st and State Sts., plans to rebuild its factory which was recently destroyed by fire. Estimated cost $200,000.

Pa., Kendall (Coraopolis P. O.)—The Duquesne Steel Fdry. Co., Farmers' Bank Bldg., Pittsburgh, plans to rebuild major portion of its foundry, which was destroyed by fire, here. Estimated cost $300,000.

Pa., Lewistown—The Amer. Refractories Co., Union Arcade, Pittsburgh, has purchased a 68 acre site, here, and will build a plant in the spring.

Pa., New Castle—The National Radiator Co., Central Ave. and Ohio St., Johnstown, will build a 1 story, 30 x 365 ft. addition to its foundry, here.

Pa., Phila.—The Abrasive Co., Tacony and Froley Sts., awarded the contract for the construction of a 1 story, 80 x 120 ft. factory. Estimated cost $8,000.

Pa., Phila.—P. Dandolfi, 41st and Poplar Sts., is receiving bids for the construction of a 2 story, 50 x 200 ft. garage on Wyoming and Mascher Sts. Estimated cost $75,000. Neubauer & Supowitz, 929 Chestnut St., Archts.

Pa., Phila.—The General Electric Co., Witherspoon Bldg., awarded the contract for the construction of a 6 story addition to its switch factory on 7th St. and Willows Ave. Estimated cost $80,000. Noted Oct. 5.

Pa., Pittsburgh—The Englert Mfg. Co., 2133 East Carson St., awarded the contract for the construction of a 2 story, 68 x 120 ft. battery factory on South 25th and Jane Sts. Estimated cost $75,000. Noted Sept. 7.

Pa., Pittsburgh—The Neely Nut & Bolt Co., 46 South 22nd St., awarded the contract for the construction of a 1 story, 120 x 150 ft. and 21 x 113 ft. bolt plant. Noted Oct. 12.

Pa., Pittsburgh—The Pure Oil Co., Chestnut and High Sts., Columbus, O., is having plans prepared for the construction of a 1 story, 80 x 150 ft. garage, here. Private plans.

W. Va., Parkersburg—The Blackwood Electric Steel Corp. is receiving bids on steel for a 1 story, 140 x 230 ft. factory, for the manufacture of castings. Mill, Rhines, Bellman & Nordhoff, 1234 Ohio Bldg., Toledo, O., Archts.

Wis., Cedarburg — The Hansen Canning Machine Co., Port Washington, is receiving bids for the construction of a 1 story, 112 x 112 ft. factory, here. Estimated cost $40,000. Private plans.

Wis., Fond du Lac—The Gurney Refrigerator Co., 64 South Brook St., awarded the contract for the construction of a power house and 3 story, 60 x 140 ft. factory for the manufacture of refrigerators. Estimated cost $60,000. E. G. Vail, Pres.

Wis., Kenosha—C. O. Augustine, Archt., is receiving bids for the construction of a 1 story, 82 x 125 ft. garage for W. Russell, 603 Milwaukee St. Estimated cost $40,000.

Wis., Manitowoc—The Aluminum Specialty Co., 17th and Wollmer Sts., awarded the contract for the construction of a 3 story, 52 x 149 ft. factory and warehouse. Estimated cost $40,000.

Wis., Manitowoc — The Van Lente-St. Clair Corp., 405 West Walnut St., Green Bay, plans to build a 2 story, 57 x 110 ft. garage and repair shop, here. Estimated cost $45,000. B. L. Van Lente, Mgr.

Wis., Milwaukee—The Harley-Davidson Motor Co., 3732 Chestnut St., is having plans prepared for the construction of a 1 story, 80 x 145 ft. addition to its factory. Estimated cost $45,000. Fereral Engr. Co., 444 Milwaukee St., engrs.

Wis., Milwaukee—Leiser & Holst, Archts., 105 Wells St., are receiving bids for the construction of a 1 story, 45 x 115 ft. addition to factory for the Milwaukee Gas Specialty Co., 2017 Clybourn St. Estimated cost $40,000.

Wis., Milwaukee—M. S. Mann, 1219 Holton St., awarded the contract for the construction of a 1 story, 50 x 110 ft. garage on 4th St. Estimated cost $40,000.

Wis., Milwaukee—The Milwaukee-Western Fuel Co., 120 Wisconsin St., awarded the contract for the construction of a 1 story, 120 x 140 ft. repair shop on Clinton St. Estimated cost $60,000.

Wis., Milwaukee—J. M. Nash, 842 30th St., manufacture of special woodworking machinery, awarded the contract for the construction of 1 story, 25 x 70 ft. and 23 x 90 ft. additions to factory. Estimated cost $8,000.

Wis., Waukesha—The Spring City Auto Co., 220 West Main St., is receiving bids for the construction of a 1 story, 65 x 190 ft. garage and repair shop. Estimated cost $40,000. B. Wolf, Mgr. Private plans.

Wis., Waupun — The Althouse-Wheeler Co. will build a 2 story factory for the manufacture of steel towers, wind mills, tanks, etc. Estimated cost $50,000. H. O. Thompson, Mgr.

Wis., Wausau—Oppenhamer & Obel, Archts., Wausau, are receiving bids for the construction of a 2 story, 60 x 60 ft. garage, for the Durant Motor Car Co., 208 Washington Ave. Estimated cost $45,000.

Wis., Wisconsin Rapids—The Prentiss-Wabers Co. plans to build a 2 story, 50 x 110 ft. factory for the manufacture of heating devices for tourists, including enameling, assembling and testing rooms. Estimated cost $50,000. Architect not selected.

Ont., Ford—The Ford Motor Co. of Canada has had plans prepared for the construction of a 1 story, 570 x 1088 ft. and a 2 story, 65 x 1088 ft. machine shop additions to automobile factory. A. Kahn, 1000 Marquette Bldg., Detroit, Mich., Archt.

Ont., London—Middlesex Motors, Ltd., 781 Dundas St., awarded the contract for the construction of a 1 story, 76 x 200 ft. garage and automobile repair shop. Estimated cost $65,000. F. B. Isaacs, Mgr. Noted Oct. 5.

Que., Montreal—Quebec Liquor Comrs., Delormier St., awarded the contract for the construction of a 75 x 100 ft. garage. Estimated cost $50,000. Noted Sept. 21.

General Manufacturing

Calif., Isleton—J. F. Butts Co., 2 Pine St., San Francisco, subsidiary of Warmington-Duff Co., 2 Pine St., San Francisco, is receiving bids for the construction of a 1 story cannery, 100 x 260 ft. main building, 80 x 120 ft. warehouse, 36 x 200 ft. wharf, 30 x 70 ft. canhouse and boiler room building, also 30 cottages for employees and apartment house to house 200 families, here. Estimated cost $150,000. W. J. Miller, 417 Market St., San Francisco, Archt.

Calif., Lodi—The Trustees of Lodi Union High School District will receive bids until Dec. 7 for the construction of a 2 story science building, a 2 story auditorium, 1 story manual training buildings, swimming tank and alterations to present structures. Estimated cost $250,000. Wright & Satterlee and L. S. Stone, Bank of Italy Bldg., Stockton, Archts.

Calif., Newman—The National Ice Cream Co., 371 Guerrero St., San Francisco, is receiving bids for the construction of a 2 story ice cream plant, here. Wieland-Mazurette-Wieland, 1002 H St., Modesto, Archts.

Calif., San Diego—M. J. Lyon, Engr. and Archt., 521 Union Bldg., is receiving bids for the construction of a gas plant for 7,000 population, at Tia Juana, Mexico, for the Zarocoza Investment Co., 521 Union Bldg., who has purchased a 645 acre town site there.

Calif., San Francisco—The General Mfg. Co., Pacific Bldg., awarded the contract for the construction of a 1 story, 140 x 192 ft. box factory on Railroad, Paul and San Bruno Aves. Estimated cost $35,000. Noted Nov. 16.

Calif., San Francisco—The National Ice Cream Co., 371 Guerrero St., awarded the contract for the construction of a 2 story ice cream plant on Guerrero St. near 16th St. Estimated cost $50,000.

Calif., San Francisco—The Reinhart Lumber & Planing Mill Co., 17th and Kansas Sts., has purchased a 5 acre site in the southern section of the city and plans to build a planing mill.

Calif., San Francisco—The San Francisco Chronicle, Chronicle Bldg., plans to build a newspaper plant, loft and office building on 5th and Mission Sts. M. D. De Young, owner.

Calif., Tracy—The General Milk Co. of California awarded the contract for the construction of a milk plant. Estimated cost $75,000. Noted Oct. 26.

Colo., Denver—The Blaney-Murphy Co., Stock Yards, is having preliminary plans prepared for the construction of a 5 story packing plant on 48th and Gilpin Sts. Estimated cost $750,000. Private plans.

Conn., Waterbury—Reymond Bros., 400 South Main St., awarded the contract for the construction of additions to its plant, consisting of a 1 story, 56 x 85 ft. garage and a 2 story, 40 x 80 ft. bakery. Estimated cost $40,000.

Ga., Atlanta—The White Provision Co., Howell Mill Rd., awarded the contract for the construction of a packing plant. Estimated cost $250,000.

Ill., Chicago—F. T. Hoyt, c/o A. S. Alschuler, Archt., 28 East Jackson Blvd., awarded the contract for the construction of a 3 story, 105 x 175 ft. printing plant on Congress and Laflin Sts. Estimated cost $250,000.

Ill., Chicago—Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St., are receiving bids for the construction of a 1 and 2 story, 75 x 140 ft. laundry on Flournoy St. near La Vergne St., for the New Way Home Service Corp., c/o architects. Estimated cost $50,000.

Ky., Paducah — The Paducah Ice Co. plans to build 2 additional units to its ice manufacturing plant. Estimated cost $70,000. Architect not announced.

Mass., Clinton—Lockwood, Greene & Co., Engrs., 24 Federal St., Boston, will soon receive bids for the construction of an addition to dry and wet finishing departments and dyehouse, to contain about 15,000 sq.ft. of floor space, for the Roubaix Mills, 792 Main St., here.

Mass., Holyoke—J. Wisly, 18 Hitchcock St., awarded the contract for the construction of a 1 story, 20 x 32 ft. addition to printing plant. Estimated cost $6,500.

Mass., Pittsfield—The Pittsfield Coal Gas Co., South St., is having plans prepared for the construction of a 2 story addition to its gas plant. Cost between $15,000 and $20,000. Harding & Seaver, 7 North St., Archts.

Mich., Highland Park—The Ford Motor Co. awarded the contract for the construction of a 1 story transfer building on Manchester Ave. Estimated cost $400,000. Noted Nov. 2.

Mich., Lansing—W. S. Holmes, Archt., Tussing Bldg., will receive bids in the spring for the construction of a 4 story, 84 x 280 ft. cold storage plant on Kalamazoo St., for the United Produce Co., c/o Architect. Estimated cost $200,000.

Mich., Petoskey—The Petoskey Portland Cement Co. is having preliminary plans prepared for extending factory, stock house and power plant. Estimated cost $500,000. J. C. Buckley, 1st Natl. Bank Bldg., Chicago, Engr.

Minn., Morgan Park (Duluth P. O.)—The Universal Portland Cement Co. will build a 2 story, 18 x 100 ft. addition to its raw material mill and a 2 story, 68 x 247 ft. burner building. Estimated cost $249,500. Noted Aug. 3.

Mo., St. Louis—The Johansen Bros. Shoe Co., 3640 Laclede Ave., awarded the contract for the construction of a 4 story, 55 x 105 ft. addition to its shoe factory, also a 3 story, 47 x 71 ft. administration building on Laclede St. near Grand Blvd. Estimated cost $100,000.

Mo., St. Louis—A. B. Plows, 1010 North 10th St., is having plans prepared for the construction of a 3 story, 35 x 140 ft. factory for the manufacture of mattresses. Estimated cost $25,000. E. J. Lawler, 1028 Chemical Bldg., Archt.

N. J., Hammondton—The Littlefield Ice Co. awarded the contract for the construction of a 3 story ice and storage plant. Estimated cost $50,000.

N. Y., Jamestown — The Clarke Baking Co., 809 North Main St., plans to rebuild major portion of its bakery on Richmond Pl., which was recently destroyed by fire. Estimated cost $50,000. Architect not announced.

N. Y., Jamestown—The New Ice & Coal Co., 925 Clinton St., plans to build an ice manufacturing plant. Estimated cost $18,000. Architect not announced.

N. Y., Rochester—The Rochester Gas & Electric Corp., Clinton Ave., N., plans to build a complete new water gas plant, capacity, 4,000,000 to 5,000,000 cu.ft. per day, on Platt St. J. Haftnkamp, Supt.

N. Y., Rochester—The Rochester Packing & Cold Storage Co., 78 Front St., awarded the contract for remodeling and building an addition to its plant. Estimated cost $200,000.

N. Y., Sheepshead Bay (Brooklyn P. O.)—The Superior Ice Co., Inc., 50 East 42nd St., New York City, will soon award the contract for the construction of an ice plant on Ave. Z and East 17th St., here. Estimated cost $250,000. W. Mortensen, 209 West 76th St., New York City, Engrs. and Archts. Noted Oct. 5.

O., Akron—The General Tire & Rubber Co., 1708 East Market St., awarded the contract for the construction of a 1 and 3 story, 40 x 180 ft. and 60 x 100 ft. additions to its factory. Estimated cost $100,000. Noted Nov. 16.

O., Cleveland—The Richard W. Kaase Co., 2836 Lorain Ave., awarded the contract for the construction of a 2 story, 68 x 150 ft. bakery. Estimated cost $150,000. Noted June 1.

Okla., Ardmore—The Consumers Light and Power Co. plans to build a 6,000 ton cold storage house. Estimated cost $100,000.

Ore., Haines—The Commercial Creamery plans to rebuild its plant which was destroyed by fire. Estimated cost $75,000. A. H. Goodhue, Pres.

Pa., Johnstown — The Edward Hahn Packing Co., Hickory St. and Baltimore & Ohio R.R., is receiving bids for the construction of a 3 story, 48 x 108 ft. and 24 x 112 ft. addition to its packing plant. Estimated cost $65,000. Private plans.

Pa., Oakmont—The Valve Bag Co. of America, 3444 Summit Ave., Toledo, O., awarded the contract for the construction of a 2 story, 74 x 94 x 157 x 158 ft. addition to its paper bag factory. Noted Oct. 19.

Pa., Phila.—The Amer. Ice Co., 6th and Arch Sts., awarded the contract for the construction of an ice manufacturing plant on Duncannon and Mascher Sts. Noted Nov. 16.

Pa., Phila.—The National Biscuit Co., 10th Ave. and 15th St., New York City, awarded the contract for the construction of an 8 story, 150 x 257 ft. bakery on 12th and Glenwood Ave., here. Estimated cost $1,000,000.

Pa., Phila.—The Paper Mfg. Co., 562 Cherry St., awarded the contract for the construction of a 6 story, 120 x 180 ft. paper factory on 5th St. and Willows Ave. Noted Oct. 12.

Pa., Pittsburgh—The Auto Truck Equipment Co., 7511 Penn Ave., and A. G. Wickersham, Archt., 517 McClure Ave., Homestead, are receiving bids for the construction of a 1 story, 31 x 99 ft. auto trim and paint shop at 7505 Penn Ave.

Pa., Pittsburgh—The Crandall McKenzie Co., Jenkins Arcade, awarded the contract for the construction of a 2 story, 20 x 60 ft. addition to its dyeing plant at 7029 Chaucer St. Estimated cost $10,000.

Pa., Pittsburgh—The F. J. Kress Box Co., 2930 Liberty Ave., awarded the contract for the construction of a 3 story, 70 x 155 ft. addition to its box factory. Estimated cost $40,000. Noted Nov. 16.

Pa., Ridgway—Hyde Murphy Co. will build a 4 story, 60 x 90 ft. addition to its woodworking factory.

Pa., Tullytown — The Megargee Paper Mills, 16 South 6th St., Phila., plans to build a paper plant, here. Architect not selected.

R. I., Providence—The Crompton & Knowles Loom Wks., 93 Grand St., Worcester, Mass., will soon award the contract for the construction of a 2 story, 50 x 170 ft. addition to its plant on Harris Ave., here. Estimated cost $60,000. Private plans.

Tex., Dallas—E. M. Thomas, c/o Trinity Constr. Co., S. W. Life Bldg., will receive bids until January 1, for the construction of a 2 story, 75 x 140 ft. ice cream cone factory at 2220-22 South Harwood St., for the Consolidated Wafer Co., 2426 South Harwood St. Estimated cost $10,000. L. D. Pape, Secy. and Mgr.

Tex., McKinney—The Texas Cotton Mills Co. plans to double capacity of present textile mill and industrial housing. Estimated cost $750,000. Engineer not selected.

W. Va., Charleston—The Evans Lead Co., Essex Fells, N. J., awarded the contract for the construction of a 1 story, 50 x 180 ft. and a 4 story, 50 x 180 ft. plant for the manufacture of lead products, here.

W. Va., Clarksburg—The Clarksburg Ice & Storage Co. will build a 1 story, 50 x 120 ft. ice plant. Estimated cost $50,000. Noted Oct. 12.

W. Va., Huntington—The Nightrack Mfg. Co. awarded the contract for the construction of a 2 story, 40 x 120 ft. woodworking factory. Estimated cost $25,000. Noted Nov. 23.

W. Va., Logan—The Logan Ice Co. is having plans prepared for remodeling and building a 22 x 100 ft. addition to its ice plant. A. C. Bishop, 427 Guardian Bldg., Cleveland, O., Engr.

W. Va., Princeton—The Princeton Hosiery Mills Co. will build a 2 story, 48 x 118 ft. hosiery mill. Estimated cost $25,000. Noted Oct. 26.

W. Va., Shinnston—The Alley Glass Co. will soon receive bids for the construction of a glass factory. Estimated cost $250,000. L. Alley, Pres. Architect not announced.

Wis., Denmark—The Danish Pride Milk Co., 608 North 8th St., Sheboygan, plans to build a 2 story condensery and milk factory, here. Estimated cost $60,000. Architect not selected.

Wis., Milwaukee — The Federal Rug Cleaning Co., 914 Winnebago St., awarded the contract for the construction of a 2 story, 50 x 60 ft. addition to its factory. Estimated cost $20,000. Noted Nov. 23.

Wis., Milwaukee—The Wisconsin Ice & Coal Co., 216 West Water St., awarded the contract for the construction of a 1 story, 114 x 120 ft. ice manufacturing plant on 31st and Galena Sts. Estimated cost $60,000.

Wis., New London—The Wisconsin Cabinet & Panel Co. will build a 2 story, 72 x 112 ft. box factory. Estimated cost $60,000. J. H. McLaughlin, Mgr.

Wis., Sheboygan—The Vollrath Co., West Michigan Ave., awarded the contract for the construction of a 2 story, 180 x 200 ft. enameling factory, including annealing and stamping room. Estimated cost $55,000. D. F. Riess, Secy.

B. C., Vancouver—Cranes Shipyard, Ltd., North Vancouver, plans to build marine ways and repair plant on Georgia and Denman Sts. Estimated cost $40,000.

Ont., Niagara Falls—The Welland Packing Co., Ltd., Welland, awarded the contract for the construction of a packing and canning factory along the tracks of the Michigan Central R.R., here. Estimated cost $44,000.

Que., Hull—The Lion Meade Tire Co. awarded the contract for the construction of a 2 story factory at Wrightville. Estimated cost $75,000.